National Library
of Canada

Bibliothèque nationale
du Canada

Canadian Theses Service

Services des thèses canadiennes

Ottawa, Canada
K1A 0N4

CANADIAN THESES

THÈSES CANADIENNES

NOTICE

The quality of this microfiche is heavily dependent upon the quality of the original thesis submitted for microfilming. Every effort has been made to ensure the highest quality of reproduction possible.

If pages are missing, contact the university which granted the degree.

Some pages may have indistinct print especially if the original pages were typed with a poor typewriter ribbon or if the university sent us an inferior photocopy.

Previously copyrighted materials (journal articles, published tests, etc.) are not filmed.

Reproduction in full or in part of this film is governed by the Canadian Copyright Act, R.S.C. 1970, c. C-30. Please read the authorization forms which accompany this thesis.

AVIS

La qualité de cette microfiche dépend grandement de la qualité de la thèse soumise au microfilmage. Nous avons tout fait pour assurer une qualité supérieure de reproduction.

S'il manque des pages, veuillez communiquer avec l'université qui a conféré le grade.

La qualité d'impression de certaines pages peut laisser à désirer, surtout si les pages originales ont été dactylographiées à l'aide d'un ruban usé ou si l'université nous a fait parvenir une photocopie de qualité inférieure.

Les documents qui font déjà l'objet d'un droit d'auteur (articles de revue, examens publiés, etc.) ne sont pas microfilmés.

La reproduction, même partielle, de ce microfilm est soumise à la Loi canadienne sur le droit d'auteur, SRC 1970, c. C-30. Veuillez prendre connaissance des formules d'autorisation qui accompagnent cette thèse.

THIS DISSERTATION
HAS BEEN MICROFILMED
EXACTLY AS RECEIVED

LA THÈSE A ÉTÉ
MICROFILMÉE TELLE QUE
NOUS L'AVONS REÇUE

NL 339 (r. 86/01)

Canada

National Library of Canada
Bibliothèque nationale du Canada

Ottawa, Canada
K1A 0N4

30

TC –

0-315-22896-2

CANADIAN THESES ON MICROFICHE SERVICE – SERVICE DES THÈSES CANADIENNES SUR MICROFICHE

PERMISION TO MICROFILM – AUTORISATION DE MICROFILMER

- Please print or type – Écrire en lettres moulées ou dactylographier

AUTHOR – AUTEUR

Full Name of Author – Nom complet de l'auteur: GARY WILLIAM RAMEY

Date of Birth – Date de naissance: MAY 20, 1948

Canadian Citizen – Citoyen canadien: ☑ Yes / Oui ☐ No / Non

Country of Birth – Lieu de naissance: CANADA

Permanent Address – Résidence fixe:
RR# 1 LAHAVE
LUN CO N.S B0R 1C0

THESIS – THÈSE

Title of Thesis – Titre de la thèse: The Role of Planning In Reading Comprehension

Degree for which thesis was presented / Grade pour lequel cette thèse fut présentée: PhD

Year this degree conferred / Année d'obtention de ce grade: 1985

University – Université: University of Alberta

Name of Supervisor – Nom du directeur de thèse: Dr. Marion Jenkinson

AUTHORIZATION – AUTORISATION

Permission is hereby granted to the NATIONAL LIBRARY OF CANADA to **microfilm** this thesis and to **lend** or **sell copies of the film.**

The author reserves other publication rights, and neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without the author's written permission.

L'autorisation est, par la présente, accordée à la BIBLIOTHÈQUE NATIONALE DU CANADA de **microfilmer** cette thèse et de **prêter** ou de **vendre des exemplaires du film.**

L'auteur se réserve les autres droits de publication; ni la thèse ni de longs extraits de celle-ci ne doivent être imprimés ou autrement reproduits sans l'autorisation écrite de l'auteur.

ATTACH FORM TO THESIS – VEUILLEZ JOINDRE CE FORMULAIRE À LA THÈSE

Signature: Gary W. Ramey

Date: October

NL-91 (r. 84/03)

Canada

THE UNIVERSITY OF ALBERTA

THE ROLE OF PLANNING IN READING COMPREHENSION

by

© GARY WILLIAM RAMEY

A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF DOCTOR OF PHILOSOPHY

DEPARTMENT OF ELEMENTARY EDUCATION

EDMONTON, ALBERTA
FALL, 1985

THE UNIVERSITY OF ALBERTA

RELEASE FORM

NAME OF AUTHOR Gary William Ramey

TITLE OF THESIS The Role of Planning in Reading Comprehension

DEGREE FOR WHICH THESIS WAS PRESENTED Doctor of Philosophy

YEAR THIS DEGREE GRANTED 1985

Permission is hereby granted to THE UNIVERSITY OF ALBERTA LIBRARY to reproduce single copies of this thesis and to lend or sell such copies for private, scholarly or scientific research purposes only.

The author reserves other publication rights, and neither the thesis nor extensive extracts from it may be printed or otherwise reproduced without the author's written permission.

(Signed) Gary W. Ramey

PERMANENT ADDRESS:

R.R. #1
LaHave, Lun. County
Nova Scotia B0R 1C0

DATED...October.10..............1985

THE UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research, for acceptance, a thesis entitled "The Role of Planning in Reading Comprehension" submitted by Gary William Ramey in partial fulfilment of the requirements for the degree of Doctor of Philosophy.

Marion D. Jenkinson
Supervisor

J P Das

W Fagan

Grace Malicky

Roderick H. McLeod
External Examiner

Date October 4, 1985

DEDICATION

I wish to pay tribute to my parents Anita and William and to my sister Patricia for their love and encouragement in the early years.

I especially wish to thank my wife, Deborah, for her contribution as a research assistant, her hard work and dedication in organizing and managing our household during my absence, for her unswerving love, devotion and encouragement and for presenting me with our son, Stefan, just before the completion of this work. You are dearly loved and immensely appreciated.

ABSTRACT

The study was designed to examine cognitive planning in relation to reading comprehension and was conducted in two phases. Phase I, carried out in 1980, involved administering tests of cognitive planning ability (Visual Search and Trail Making); successive synthesis (Digit Span and Auditory Serial Recall); and simultaneous synthesis (Memory for Designs and Figure Copying) to 148 grade IX subjects in a rural junior high school in Nova Scotia. These measures are part of the Cognitive Synthesis Battery (Das, Kirby, & Jarman, 1979). Subjects were also administered the Group Embedded Figures Test (GEFT) a measure of the cognitive style variable field dependence/independence; Ravens Progressive Matrices, a frequently used measure of IQ, and the Cooperative Reading Test, a standardized measure of reading achievement.

Three way analysis of variance was used to examine information integration and reading achievement as defined by the vocabulary, speed of comprehension, and level of comprehension subtests of the CRT. A median split was performed on the scores of the visual search test (planning), Auditory Serial Recall (successive synthesis), and Figure Copying (simultaneous synthesis). This procedure was then executed on the vocabulary, speed of comprehension, and level of comprehension subtest scores on the CRT. In

this way is was possible to compare information integration group placement with reading achievement.

Subjects' scores were computer sorted on the Visual Search test (planning) and 30 subjects were chosen to participate in phase II of the study. This included the 15 fastest and 15 slowest performers on the planning task.

Phase II of the research, carried out four years later in 1984, consisted of administering selected marker tests of information integration to the phase II participants. In addition, these subjects were administered individualized researcher designed reading tasks. These consisted of Silent Reading Uninterrupted Recall (SRUR); Silent Reading Interrupted Recall (SRIR) and Silent Reading Sentence Retrospection (SRSR). Three different types of passage format were also used - Narration (N), Exposition (E), and Persuasion (P). The technique of analytical introspection retrospection was employed to collect the data on these individualized tasks.

Some of the key phase I findings of this study were 1) cognitive planning and simultaneous synthesis are related to level of comprehension as defined by the Cooperative Reading Test; 2) successive processing ability is related to speed of comprehension as defined by the CRT; 3) both simultaneous and successive synthesis are related to vocabulary performance as defined by the CRT.

Phase II findings revealed that subjects who were in the proficient planning group produced more analyzable units, and of these, placed more in the inferential and speculative categories than less proficient planners. The latter tended to produce more erroneous responses. Moreover, proficient planners generated more hypotheses, modified their hypotheses, and questioned and evaluated their responses. They related material to their experiential background, displayed better critical reading skills and were more aware of passage format characteristics than less proficient planners. Finally, the proficient planners in this study achieved greater success in their academic and career pursuits than the less proficient planners as borne out by their biographical profiles.

ACKNOWLEDGEMENTS

The author wishes to acknowledge with great appreciation the contribution of his Supervisor, Dr. Marion Jenkinson. Her multidisciplinary perspective on the field of reading, combined with her insightful comments and academic professionalism, aided substantially in the preparation, planning, and reporting of the research. Appreciation is also expressed to the other members of the supervisory committee; Dr. J.P. Das for his scholarly comments and his expertise in the area of cognitive synthesis and Dr. William Fagan for his ability to listen and for his insightful comments on matters regarding the qualitative protocol analysis. I wish to sincerely thank examining committee member Dr. Grace Malicky for her helpful organizational and editorial suggestions. The constructive criticism of external examiner Dr. Rod McLeod was also greatly appreciated.

The writer also wishes to thank Dr. Dwight Harley for his accessibility and expertise in the area of statistical methods. Finally, I wish to pay tribute to Dr. Russ MacArthur for expanding my views regarding research methods and procedures. His demise prior to the final completion of this document is a source of great sadness and regret.

The author acknowledges and thanks the Nova Scotia Department of Vocational Education as well as Mr. N.L. Brown, principal of the Lunenburg Regional Vocational

School, and the Lunenburg Regional Vocational School Board for granting me the time to work on and complete this doctoral study.

Sincere appreciation is extended to Mr. J. David Pottie, former Chief Educational Officer of the Lunenburg District School Board, and Mr. J.R. Nichols, former principal of the Hebbville Consolidated Junior High School for permitting me to conduct research in the Hebbville Junior High School.

The writer wishes to acknowledge and thank the 1980-81 Grade IX classes at Hebbville Consolidated Junior High School who participated in Phase I of the study, as well as the 1983-84 Cosmetology and Electronics students at Lunenburg Regional Vocational School who took part in the pilot testing. Sincere thanks is extended to those who agreed to participate in Phase II of the research. It is their contribution that meant so much toward the final outcome of this work.

The contribution of the following individuals is also greatly appreciated: Mr. James Crouse and Ms. Sheila Troyer who assisted in the data collection; and Ms. Jean Bolivar who served as a rater in categorizing the reading protocols in the Phase II research.

Special thanks is also extended to Mrs. Kay Davis, Mrs. Heather Woodworth and Mrs. Shirely Himmelman who, along with their respective business classes at the Lunenburg Regional Vocational School, agreed to transcribe hours of taped protocols into typed form. A note of thanks is also extended to Mrs. Shannon Tenove who did such a masterful job on the final manuscript.

Finally, I wish to pay tribute to my good friend and colleague Dr. Claudia Mitchell, whose sense of humor and scholarly comments were always appreciated.

TABLE OF CONTENTS

Chapter Page

1 OVERVIEW OF THE STUDY.......................... 1

Purposes of the Study..................... 3

Definitions............................... 4

Research Questions and Hypotheses......... 10

Plan of the Study......................... 12

Assumptions.......................... 13

Delimitations of the Study................ 14

Significance of the Study................. 15

Outline of the Dissertation............... 16

2 BACKGROUND OF THE STUDY........................ 17

Luria's Neurospychological Paradigm of Information Processing.................... 20

Other Views of Planning................... 34

Metacognition........................ 34

Scripts, Plans and Goals............. 36

Planning and Reading................. 38

Decision, Choice and the Nature of the Individual........................ 44

Factors Affecting Decision Making......... 46

The Fluent Reading Act.................... 54

The Importance of Coding, Planning, and Decision Making in Fluent Reading......... 59

Information Integration and Reading....... 68

Chapter Page

Analytical Introspection/Retrospection and Protocol Analysis.................... 70

Summary.................................. 73

3 INVESTIGATIVE TECHNIQUES AND RESEARCH PROCEDURES................................ 74

Design.................................. 74

Design of Phase I........................ 75

Sample.............................. 75

Phase I--Instrumentation and Data Collection........................... 77

Treatment of Data........................ 86

Phase I............................. 86

Design of Phase II....................... 89

Sample.............................. 89

Phase II--Instrumentation and Data Collection............................. 91

The Pilot Test........................... 93

Phase II--Treatment of the Data........... 98

Summary.................................. 114

4 QUANTITATIVE ANALYSES......................... 115

Factor Analyses.......................... 115

ANOVA Analyses........................... 121

Information Integration Group Placement... 129

Summary.................................. 140

Chapter Page

5 PHASE II RESEARCH RESULTS.................. 141

Post Hoc Testing on Selected Measures of Information Integration............... 141

Establishment of Inter-rater Reliability.............................. 147

Qualitative Protocol Analysis Phase II... 151

High Planning, Low Successive, High Simultaneous in Comparison With Low Planning, High Successive, Low Simultaneous............................. 174

Summary.................................. 200

6 SUMMARY, CONCLUSIONS, AND IMPLICATIONS...... 202

Findings and Conclusions................. 204

Analyses of Data Generated in Phase I.............................. 204

Limitations of the Findings of the Study................................... 213

Implications............................. 214

Reading Theory....................... 214

Reading Instruction.................. 215

Reading Test Construction............ 217

Teacher Preparation.................. 217

Suggestions for Future Research.......... 218

Concluding Statement..................... 220

Chapter Page

BIBLIOGRAPHY.. 221

APPENDIX A DIRECTIONS FOR ADMINISTERING INDIVIDUALIZED READING TASKS............. 234

APPENDIX B TITLE AND SOURCE FOR ALL PASSAGES USED IN PILOT TESTING......................... 236

APPENDIX C COMPLETE SELECTIONS USED IN PHASE II RESEARCH................................ 239

LIST OF TABLES

Table Page

3.1 15 Most Proficient and 15 Least Proficient Planners.......................... 90

3.2 Cloze Performance and Fry Readability Level of Pilot Tested Passages According to Type, and Passage Title.................. 97

3.3 Passages Selected for Phase II Research..... 99

3.4 Design of Qualitative Analysis Paradigm by Task, Passage Type and Response Type........ 103

3.5 The Results of the Silent Reading Uninterrupted Recall Task for Subjects Participating in the Pilot Test............. 104

3.6 Silent Reading Interrupted Recall (SRIR) Pilot Test Results for Subjects According to Subject Passage Format and Response Type.... 108

3.7 Hypotheses Generated by Subjects on the SRIR Passages.............................. 109

3.8 Silent Reading Sentence Retrospection Pilot Test Results According to Subject, Passage Format, and Response Type........... 112

4.1 Results of Principal Components Analysis of Measures of Information Integration, IQ, Cognitive Style, and Reading (Varimax Rotation, N = 148)................. 116

4.2 Results of Principal Components Analysis of Measures of Information Integration, IQ, Cognitive Style, and Reading (Varimax Rotation, N = 140) RT Omitted...... 118

4.3 Analysis of Variance Summary Table for Planning (A) X Successive Synthesis (B) X Simultaneous Synthesis (C) With Vocabulary as the Dependent Variable........ 122

Table Page

4.4 Cell Means of 3 Way ANOVA.................. 123

4.5 Analysis of Variance Summary Table for Planning (A) X Successive Synthesis (B) X Simultaneous Synthesis (C) With Speed of Comprehension as the Dependent Variable..... 124

4.6 All Means for Subjects in 3 Way ANOVA Who Were Above and Below the Median on the Dependent Variable Speed of Comprehension... 125

4.7 Planning (A) X Successive Synthesis (B) X Simultaneous Synthesis (C) With Level of Comprehension as the Dependent Variable.. 126

4.8 Cells Means for Subjects in 3 Way ANOVA Who Were Above and Below the Median on the Dependent Variable Level of Comprehension................................ 127

4.9 Mean Scores on Reading Subtests of the CRT for Groups Divided into High (Above the Median) and Low (Below the Median) on the Information Integration Marker Tests................................ 128

4.10 Method for Assigning Subjects to Information Integration Groups.............. 129

4.11 Classification System for Assigning Subjects to Information Integration Groups.. 130

4.12 Size of N for Eight Information Integration Groups.......................... 131

4.13 Medians Used to Classify Subjects According to Reading Proficiency (Subtests of the Cooperative Reading Test)................ 132

4.14 Information Integration Group's Score With Assigned Reading Score...................... 132

4.15 Percentage of Subjects Above Median on Vocabulary, Speed of Comprehension, and Level of Comprehension for Information Integration Group 4 (HLL) N = 11............ 135

Table Page

4.16 Percentage of Subjects Above Median in Vocabulary, Speed of Comprehension, and Level of Comprehension for All Information Integration Groups.......................... 136

4.17 Correlations of All Measures Administered to Phase I Subjects N = 140................. 139

5.1 Comparison Between 1980 and 1984 Scores for High and Low Planners on the Auditory Serial Recall Test (Successive Synthesis)... 142

5.2 Comparison Between 1980 and 1984 Scores for High and Low Planners on the Digit Span Test.................................. 144

5.3 Comparison Between 1980 and 1984 Scores for High and Low Planners on the Figure Copying Test............................... 145

5.4 Comparison Between 1980 and 1984 Scores for High and Low Planners on the Memory for Designs Test (Simultaneous Processing).. 146

5.5 Percentage of Agreement and Disagreement Between Researcher and Raters 1 and 2 with Regard to 't' Unit Classification (Text Specific, Text Inferential, Text Erroneous, and Text Speculative)........................ 149

5.6 Planning, Successive, and Simultaneous Processing Abilities of Phase II Subjects.................................... 150

5.7 Total 't' Unit Production by One HHH and One LLL Subject............................ 152

5.8 Analysis of Protocol Output by Response Type...................................... 153

5.9 Classification of 't' Unit Responses Into Categories for One HHH and One LLL Subject Who Are Representative of These Groups...... 154

Table Page

5.10 Phase I Placements According to Planning, Successive Synthesis, and Simultaneous Synthesis.................................... 174

5.11 Qualitative Results by Subject, Passage Type, and Response Classification for HLH Subjects.................................. 176

5.12 Qualitative Results by Subject, Passage Type, and Response Classification for LHL Subjects.................................. 177

5.13 Comparison of One HLH and One LHL Subject According to 't' Unit Production and Response Type.............................. 182

5.14 Analyzable Units Produced on the SRUR (N) (P) and SRSR (N) Passages by One HLL Subject and One HHL Subject................. 197

LIST OF FIGURES

Figure		Page
2.1	Factors Describing the Fluent Reader and the Fluent Reading Act Ramey/Mitchell 1979	19
2.2	Information Integration Model	23
2.3	Summary of Luria's "Functional Systems" of the Brain	24
2.4	Measures of Planning, Successive Synthesis and Simultaneous Synthesis	31
5.1	Personal Profiles of the HHH and LLL Readers	156
5.2	Personal Profiles of HLH and LHL Readers	175
5.3	Biographical Profiles of One HLL and One HHL Subject	196
5.4	Qualitative and Quantitative Differences Observed in Recall Data by Proficient and Less Proficient Planners in This Study	201

CHAPTER 1

OVERVIEW OF THE STUDY

The process of reading has long fascinated man. Historically speaking, readers have been alternatively revered or persecuted for possessing this most awesome ability. Nations, as well as individuals, have seen the value of literacy in attaining the goals of the state. This truism is observable today as many countries continue to extend their spheres of influence through the power of the written word.

For these reasons, the processes which constitute the miracle of reading have come under the scrutiny of researchers from a number of academic disciplines--psychology, linguistics, electronics (Shannon and Weaver, 1949; Smith, 1971) and computer science (Schank, 1969) to name but a few. In an effort to see more clearly what is going on when the reader interacts with the text, an inter-disciplinary approach has sometimes been taken. The psycholinguistic view of the reading act is a case in point. Such a perspective is not surprising, since the importance of thought and language to learning has a well documented history in the literature of psychology (Vygotsky, 1934) as well as reading (Smith, 1971; Pearson, 1978).

For this reason, in the present research, the fluent reading act was defined according to a psycholinguistic information processing perspective (Smith, 1971) incorporating the notion of simultaneous and successive synthesis as described by Luria (1966a, 1966b, 1973) and later labelled information integration by Das, Kirby and Jarman (1979). Research conducted in this area seems to indicate that an individual's ability to code information in a manner appropriate to the task demands and to formulate plans or programs to organize, initiate, and monitor cognitive activity can profoundly affect task performance.

The Information Integration model (Das, Kirby, & Jarman, 1979) is particularly applicable to the field of reading because it takes a "process" (examining strategies) rather than a "product" (measuring outcomes) approach to cognitive behaviour and because there seems to be an indication that it is possible, in terms of remediation, to teach appropriate processing strategies to the inefficient processor (Krywaniuk, 1974; Kaufman, 1978).

To the extent that others have discussed the role of planned behaviour in cognitive activity, the work of Flavell (1979) in metacognition, Schank & Abelson (1977) in artificial intelligence and Rumelhart (1975) in schema theory has also been reviewed.

Purposes of the Study

This study was conducted with four major purposes in mind.

The first purpose was to examine the selected cognitive processing abilities of Grade IX students in relation to a standardized measure of reading achievement. The processing framework employed was that defined by Luria (1966a, 1966b) as simultaneous and successive synthesis and more recently by Das, Kirby, & Jarman (1979) as spatial information integration and temporal information integration.

The second purpose was to determine how selected grade IX students, who had been designated as very proficient planners and less proficient planners by virtue of their performance on a visual search task, interacted with the text when confronted with different types of reading material in differing reading situations.

Thirdly, the research was designed to provide insights into the relationship between overt student responses elicited through analytical introspective/retrospective techniques after silent reading and underlying cognitive processing strategies.

Finally, the study was organized so that subjects could be observed later on in their educational and personal lives to see if there were changes in their cognitive processing abilities, and to see if additional insights could be gained in relation to cognitive processing ability and academic achievement as well as subsequent post high school activity.

Definitions

In the present study, the following definitions have been employed.

Information Integration.

The process by which information is organized, integrated, and coded by the human brain. Luria (1966a, 1966b) discussed these processes under the rubric of simultaneous and successive synthesis.

Das, Kirby and Jarman (1975, 1979) have referred to these processes in their Information Integration Model as spatial information integration (simultaneous synthesis) and temporal information integration (successive synthesis). These processes take place at the perceptual, mnestic and conceptual levels. For the purposes of the present study the terms spatial information integration (simultaneous synthesis) and temporal information integration (successive synthesis) will be used interchangeably.

In addition to the two coding processes there is also an executive functioning or planning component present in the Information Integration Model (Luria, 1966 (a) (b); Ashman, 1978; Das, Kirby & Jarman, 1979).

Spatial Information Integration. A type of cognitive information processing that codes incoming information into groups or "chunks" which are spatial in nature (Das, Kirby, & Jarman, 1975, 1979). This type of processing has been labelled simultaneous processing by Luria (1966a). The terms spatial information integration and simultaneous synthesis will be used interchangeably in the present study.

Temporal Information Integration. A type of information processing that codes incoming sensory input serially (Das, Kirby, & Jarman, 1975, 1979). Because of the serial nature of this information, it is never totally accessible to the processor at any given point in time. This type of processing has been labelled successive processing by Luria (1966a). The terms temporal information integration and successive synthesis will be used interchangeably in the present study.

Planning. A type of information processing which provides a regulatory function. As such, it serves in controlling intention and purpose, programs various forms of complex activity, and monitors the results of this activity. This function can be measured in a number of ways (Ashman, 1978; Das, 1984).

Proficient Planner.

A subject who has attained a search time on the visual search test which places him among the 15 highest of all 148 subjects tested.

Less Proficient Planner.

A subject who has attained a search time on the visual search test which places him among the 15 lowest of all 148 subjects tested.

Information Integration Groups.

Eight groups of students organized on the basis of performance on a test of visual planning, a temporal information integration test (successive synthesis) and a spatial information integration test (simultaneous synthesis). Note: The visual search test score is reported in seconds and hundredths of a second. As a result fast performers have lower scores (below the median).

High Planning - High Successive - High Simultaneous Group (HHH). Those subjects with fast times (below the median) on the planning test. These subjects scored above the median on the successive synthesis test and the simultaneous synthesis test.

High Planning - Low Successive - Low Simultaneous Group. (HLL). Those subjects with fast times (below the median) on the planning test. These subjects scored below the median on the successive synthesis test and the simultaneous synthesis test.

High Planning - Low Successive - High Simultaneous Group (HLH). Those subjects with fast times (below the median) on the planning test. These subjects scored below the median on the successive synthesis test but above the median on the simultaneous synthesis test.

High Planning - High Successive - Low Simultaneous Group (HHL). Those students with fast times (below the median) on the planning test. These subjects scored above the median on the successive synthesis test and below the median on the simultaneous synthesis test.

Low Planning - Low Successive - High Simultaneous Group (LLH). Those students with slow times (above the median) on the planning test. These subjects scored below the median on the successive synthesis test and above the median on the simultaneous synthesis test.

Low Planning - High Successive - High Simultaneous Group (LHH). Those students with slow times (above the median) on the planning test. These subjects scored above the median on the successive synthesis test, and the simultaneous synthesis test.

Low Planning - High Successive - Low Simultaneous Group (LHL). Those students with slow times (above the median) on the planning test. These subjects scored above the median on the successive synthesis test but below the median on the simultaneous synthesis test.

Low Planning - Low Successive - Low Simultaneous Group (LLL). Those students with slow times (above the median) on the planning test. These subjects scored below the median on the successive synthesis test and the simultaneous synthesis test.

Personal Style.

An individual's preferred or habitual mode of dealing with sensory input and processing information. It may be influenced by socialization practices, social stratification factors, biological factors, and ecological and environmental factors.

Functional Reader.

A subject who has passed the stages of beginning reading. All grade IX subjects who participated in the initial study, by virtue of their time in the school system, were considered functional readers.

Silent Reading Uninterrupted Recall (SRUR).

A type of task in which subjects read a complete passage silently, after which an unaided recall was given.

Silent Reading Interrupted Recall (SRIR).

A type of task in which subjects read a passage silently in sections predetermined by the researcher. After each section an unaided recall was given and the subject was asked to speculate on what would happen in the next section.

Silent Reading Sentence Retrospection (SRSR).

A type of task in which the subject read silently one sentence at a time. After each sentence, subjects were asked to think aloud about what was just read.

Narration (N).

A type of passage which contained the elements of a short story--plot, character, and setting.

Exposition (E).

A text book type of passage containing facts, figures, comparisons and contrasts.

Persuasion (P).

A type of passage which presented a thesis statement around which an argument was constructed. These passages were aimed at convincing the reader that the thesis was valid.

Research Questions and Hypotheses

The theoretical stance outlined in the foregoing pages gave rise to the following research questions and null hypotheses.

Research Question 1. Are there differences on the scores of the marker tests for planning, successive synthesis, and simultaneous synthesis which affect vocabulary as measured by the Cooperative Reading Test (CRT)?

H1.1 There are no significant main effects or interactions due to planning, successive synthesis and simultaneous synthesis and vocabulary as measured by the Cooperative Reading Test (CRT)?

Research Question 2. Are there differences on the scores of the marker tests for planning, successive synthesis, and simultaneous synthesis which affect speed of comprehension?

H2.1 There are no significant main effects or interactions due to planning, successive synthesis and simultaneous synthesis and speed of comprehension as measured by the CRT.

Research Question 3. Are there differences on the scores of the marker tests for planning, successive synthesis and simultaneous synthesis which affect level of comprehension?

H3.1 There are no significant main effects or interactions due to planning, successive synthesis, and simultaneous synthesis and level of comprehension.

Research Question 4. Are there differences between the eight information integration groups, as defined in the study, in terms of the three dependent variables of vocabulary, speed of comprehension, and level of comprehension?

H4.1. There are no significant differences between the eight information integration groups in terms of the three dependent variables of

.11 vocabulary
.12 speed of comprehension
.13 level of comprehension

Research Question 5. Are the scores on the two marker tests of simultaneous synthesis, Figure Copying and Memory for Designs, stable over time?

H5.1 There are no significant changes in scores on the two marker tests of simultaneous synthesis, Figure Copying and Memory for Designs over time.

Research Question 6. Are the scores on the two marker tests of successive synthesis, Digit Span and Auditory Serial Recall, stable over time?

H6.1 There are no significant changes on the scores on the two marker tests of successive synthesis, Digit Span and Auditory Serial Recall, over time.

Research Question 7. What is the relationship between the performance of subjects on specially designed reading comprehension tasks and their information integration capabilities established three years earlier?

Research Question 8. Are there patterns of performance relating to qualitative analyses of the reading tasks and information integration?

Research Question 9. Are there other characteristics revealed which relate to the pattern of information integration ability and everyday cognitive activity?

Plan of the Study

The research was conducted in two phases spanning a period of four years. In Phase I, conducted in 1980, 148 grade IX subjects in a rural junior high school were given two tests of planning (Visual Search and Trail Making), two tests of successive processing (Digit Span and Auditory Serial Recall), and two measures of simultaneous processing (Memory For Designs and Figure Copying). These measures are all part of the Cognitive Synthesis Battery (Das, Kirby & Jarman, 1979). Phase I subjects were also given The Group Embedded Figures Test and Ravens Progressive Matrices which have been shown by previous research (Heemsbergen, 1980) to be related to simultaneous processing. The Cooperative Reading Test, a standardized reading measure which produces vocabulary, speed of comprehension and level of comprehension scores was also administered at this time.

In 1984 subjects selected by virtue of their scores on the Visual Search Test, a measure of cognitive planning ability, were contacted and asked to participate in Phase II of the research. Fifteen proficient and 15 less proficient planners were chosen for the Phase II testing. Of the 30 selected for further testing, 13 proficient and seven less proficient planners agreed to take part. These subjects, now out of high school, were given a number of researcher designed reading tests. These tests, as well as the passages read in this phase of the research, had been previously pilot tested with a similar population. The technique of analytical introspection/retrospection was used to assess these subjects' reading and processing abilities. All subject responses were tape recorded and then transcribed into typed protocols. The protocols were divided into complete and incomplete 't' units and the responses classified as text specific, text inferential, text erroneous, and text speculative. The qualitative responses elicited from these subjects were then related to their information integration capabilities as determined in Phase I of the research conducted four years earlier.

Assumptions

This study has been based on the following assumptions:

1. The fluent reader can be described as an information processor.
2. The scores achieved on marker tests of the cognitive synthesis test battery are indicators of cognitive processes which relate to the planning, organizing, coding, and restructuring of information.

3. The method of analytical introspection/retrospection following silent reading of selected passages in task specific reading situations, can provide insight into how the individual is organizing, coding, and restructuring information as he reads.

4. By employing statistical measures to examine all subjects and by using analytical introspective/retrospective techniques to examine selected subjects according to their planning abilities, it will be possible to see the relationship between the reading strategies of the students and the coding and planning processes underlying them.

Delimitations of the Study

1. The empirical study is limited to one type of school setting: a consolidated junior high school in a rural part of southwestern Nova Scotia.

2. The study examines a limited sample--140 grade IX pupils--and this may limit the generalizability of the findings.

3. Because the study took place over four years a considerable amount of time had elapsed between phase I (the empirical study) and phase II (the qualitative study). This time lag could serve to distort the results of the study.

4. To the extent that specific reading tasks have been designed which interrupt the reader, the reading process has been distorted from the actual reading situation.

Significance of the Study

For a considerable time research in the field of reading has emphasized the need to look at a specific reader, reading a specific text, at a specific time. The metacognitive approach adopted by Flavell (1976, 1979), Brown (1977a, 1977b, 1977c) and others has examined the individual's knowledge of what he is doing in a task specific and highly individualistic manner.

Whereas previous examinations in this area have examined the afferent nature of reading and cognitive synthesis in terms of organizing and coding the incoming sensory input, the current research attempts to explore the efferent nature of the relationship between information integration and reading. As McLeod (1978) noted in his research

> the suggestion has been made in this study that inference is dependent upon the psychological functions of formulating intentions and programs, and decision making (i.e., which information to use for an inference and when to stop inferencing). Luria has identified these functions with the frontal lobes of the human brain. Research methods for measuring the levels of development in these fuctions is much needed to explore further their relationships to the processes of inference. Such methods need to be developed and validated, so that further insights may be provided into the reading processes. (McLeod, 1978, p. 250)

It is from this perspective that the present study has evolved. To the writer's knowledge, this is the first attempt to examine the planning component of the Information Integration Model in relation to task specific reading activities.

Outline of the Dissertation

Chapter 1 includes a brief introduction and statement of the problem. The purposes are outlined, the research questions posed and key terms are defined. The assumptions are stated, the limitations are considered and the significance of the study is discussed.

Chapter 2 has been devoted to a review of the literature as it relates to the theoretical position adopted for the research.

Chapter 3 describes the methods of investigation and the research procedures employed. It explains the design, describes the sample and provides the rationale for the selection and development of the instruments used in data collection. The treatment of the data is also discussed.

In Chapter 4 the quantitative analyses of the Phase I research have been reported.

In Chapter 5 the qualitative analytical procedures employed in Phase II of the research have been presented.

In Chapter 6 the conclusions and implications of the findings in light of the research questions asked and the theoretical stance adopted have been discussed.

CHAPTER 2

BACKGROUND OF THE STUDY

Ever since Huey (1908) penned the now famous words

> the reading process has long seemed to me to mirror the processes of thinking and thus came to seem an appropriate subject for psychological analysis (Huey, 1908, xi).

psychologists have been attempting to uncover the variables which together constitute the fluent reading act. At times, research has become heavily entrenched in what psychologists might describe as the perceptual and cognitive domains a fact which has sometimes mitigated against a broader view of the reader and the reading process. Many psychologists today realize that there is a need to "put the organism back together." Coupled with this realization is the understanding that there is room for a variety of approaches to the study of human behaviour. The result, in some cases, has been a movement away from the strictly scientific and empirical, nomothetic approach of the past toward a more individualistic and ideographic mode of investigation. Variety in exploratory technique is as important in the field of reading as it is in many other areas of scholastic endeavour. However, it is the research questions, not methodological biases, which must ultimately determine the investigative framework employed.

The demise of the old either/or philosophy speaks well for the future of psychologically oriented research in reading. Today such an orientation is as relevant as when Huey (1908) observed

> . . . and so to completely analyze what we do when we read would almost be the very acme of a psychologist's achievements, for it would be to describe very many of the most intricate workings of the human mind, as well as to unravel the tangled story of the most remarkable specific performance that civilization has learned in all its history (Huey, 1908, p. 6).

If man is by nature a thinking, reasoning being (Monod, 1971) and if individual behaviour is the result of perceptual, cognitive, linguistic, cultural, social and personality factors, it seems that the domain of psychology could provide some fundamental insights into just "what goes on" during the reading, thinking act.

In developing such a focus the writer and a colleague (Ramey and Mitchell, 1979) attempted a description of the reading process that was three pronged. Part I outlined some antecedent factors which may foster the development of the individual as reader. Part II described in detail some personal characteristics which may have a profound affect on the individual's ability to read proficiently and Part III outlined the fluent reading act as perceived by the authors (Figure 2.1).

FIGURE 2.1

Factors Describing the Fluent Reader
and the Fluent Reading Act
Ramey/Mitchell, 1979

Antecedent and Correlational Factors	Characteristics of the Fluent Reader	Fluent Reading as an Analytico-Synthetic, Simultaneous, and Successive Process
Socialization Practices Social Stratification Factors Ecological Factors Linguistic Factors a) psycholinguistic b) sociolinguistic c) neurolinguistic Cultural Factors Bilogical Factors	Analytical Active Ability to go beyond the information given Ability to hold a visual array Reflective Moderate risk taker Ability to handle abstract stimuli Successive synthesizing Ability to reason using convergent and divergent thinking processes Ability to make inferences Ability to restructure and reorganize stimuli: autonomy, flexibility	A. Schematic interaction of reader with text--to reduce uncertainty B. Planning and decision making - attention, arousal, motivating intention -organizing and preciting (sampling of graphic, syntactic, and semantic cue sources) -hypothesis testing -risk-taking -forward and backward inferencing -restructuring and reorganizing -integrating -synthesizing -confirming -going beyond the information given C. Altered schematic state

Luria's Neuropsychological Paradigm of Information Processing

A promising theory of information processing which may help to describe the processes underlying the fluent reading act is Luria's theory of simultaneous and successive cognitive synthesis. Wittrock (1978) observes that process-oriented paradigms are useful in the study of human learning and in particular in examining individual differences. In the area of reading research, process-oriented models are apt to enhance our understanding of information processing in general, and text information in particular, as well as our understanding of the "fluent" reader himself.

The notion of simultaneous and successive synthesis in reading is not new. Huey (1908) talks of simultaneous and successive recognition of letters and whole words. Reading theorists such as Smith (1971) and Neisser (1967) refer to simultaneous processing, parallel processing and synthesis. Empirical studies exploring reading and cognitive synthesis have related Luria's paradigm to reading comprehension (Latham, 1973); inferencing (McLeod, 1978); reading achievement (Kirby & Das, 1977); reading difficulties (Cummins & Das, 1977) and spatial and temporal processing in disabled readers (Leong, 1974).

The aforementioned studies of reading and cognitive synthesis have dealt chiefly with Luria's notion of coding components in information processing. Based on his extensive research and observation of patients with cortical lesions in different areas of the brain, he was able to isolate a simultaneous coding factor and a successive coding factor. Sechenov (1878; 1973) first suggested that mental processes fall into these two categories. Luria talks of the simultaneous factor as being essentially "spatial" in nature:

> When we glance at a complicated picture we do not at once perceive all its parts but examining them gradually, we distinguish their essential elements (those giving maximal information) and we synthesize them into a single entity, a unified structure. (Luria, 1966b, p. 76)

In order to comprehend fully arithmetic and grammatical systems, it is necessary to have the elements in a "simultaneously surveyable scheme" (Luria, 1966b, p. 76). Most important in this present discussion is the relevance of simultaneous processing to language processing. Luria observed that "in the perception of the grammatical system of a language, the need for these syntheses may . . . be very clear, and their disturbance may lead to disintegration of the corresponding logico-grammatical relationships" (Luria, 1966a, p. 76).

The successive coding component is "temporal" in nature. Sechenov (1878; 1973) talks of the integration of external influences into successive series, distinguishable in time, such as narrative speech and its syntactic arrangement, as well as serial motor activity such as writing.

More recently and in keeping with Luria's description of brain processes, the presence of a strategy component which performs an executive function in relation to the two coding processes has received attention (Ashman, 1978; Das, 1978). Luria (1966) discusses the goal-directed activities controlled by frontal areas of the brain and it is Das, Kirby and Jarman (1975) who include a planning and decision-making component in a theory of information integration (see Figure 2.2).

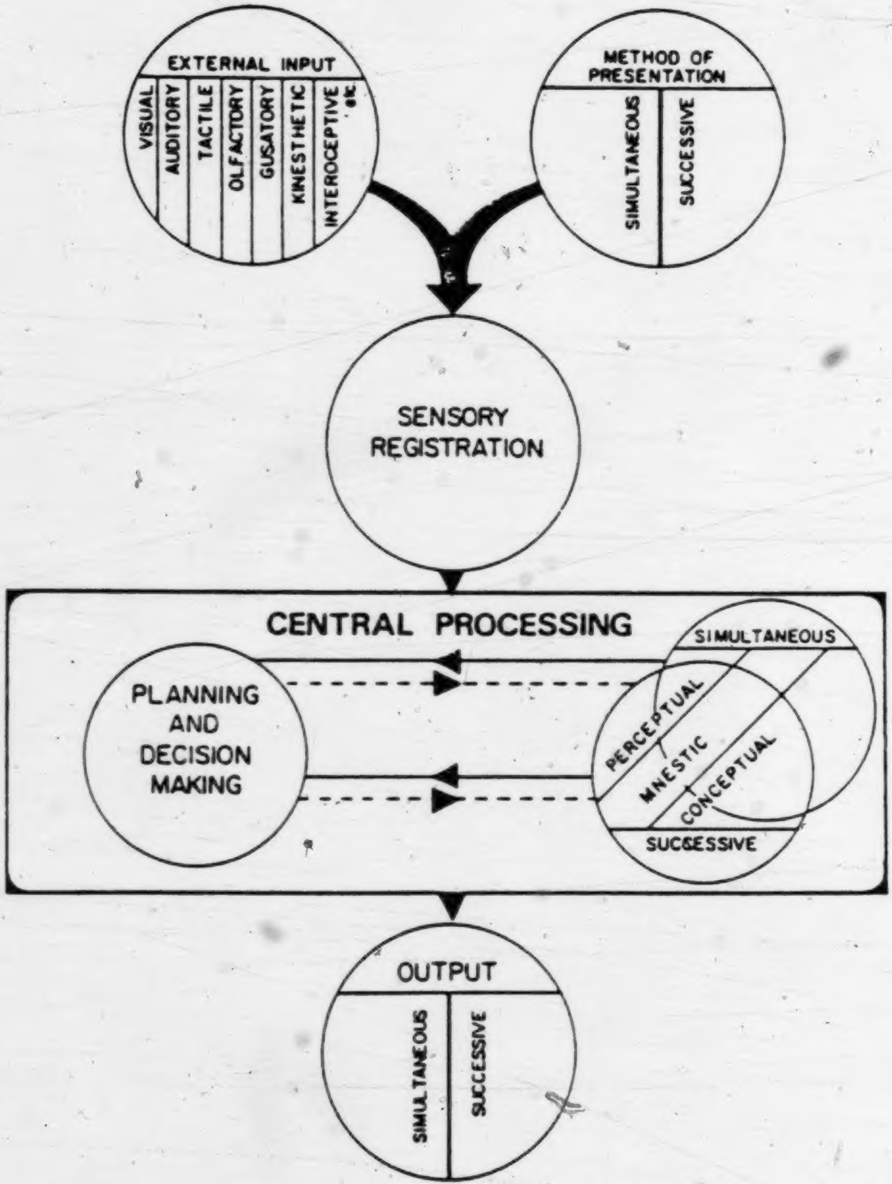
> It would be a mistake to imagine that each of these units can carry out a certain form of activity completely independently. . . . Each form of conscious activity is always a complex functional system and takes place through the combined workings of all three brain units, each of which makes its own contribution. (Luria, 1973, p. 99).

A useful outline of the three areas or "blocks" of the brain is depicted in Figure 2.3. Block 1, consisting of the upper brain stem, the reticular formation, and older parts of the limbic cortex and hippocampus is involved with wakefulness and arousal. Block 2, consisting of the parietal, occipital, and temporal lobe area is responsible for the input, recoding, and storage of information. The occipital-parietal area codes simultaneous information while the temporal area codes successive information. Block 3 consists of the pre-frontal lobes and is responsible for the construction and execution of plans and programs.

As McLeod (1978) notes, Luria's major concern has been on the "afferent" state, in terms of how the human brain

FIGURE 2.2

Information Integration Model


EXTERNAL INPUT
VISUAL
AUDITORY
TACTILE
OLFACTORY
GUSATORY
KINESTHETIC
INTEROCEPTIVE etc.
METHOD OF PRESENTATION
SIMULTANEOUS
SUCCESSIVE
SENSORY REGISTRATION
CENTRAL PROCESSING
PLANNING AND DECISION MAKING
SIMULTANEOUS
PERCEPTUAL
MNESTIC
CONCEPTUAL
SUCCESSIVE
OUTPUT
SIMULTANEOUS
SUCCESSIVE

(From Das, Kirby, & Jarman, 1975
Copyright by the American Psychological Association)

FIGURE 2.3

Summary of Luria's "Functional Systems" of the Brain

Block	Corresponding Brain Parts	Functions
1	Brain stem Reticular formation Hyppocampus	-regulates energy level and tone cortex -provides basis for organization of various processes
2	Posterior parietal and occipital lobes, and the lateral temporal lobes of the cerebrum; Organized into three hierarchical cortical zones	A. Primary Zone-sorts and records sensory information B. Secondary Zone-organizes information further and codes it
3	Frontal lobes of the cerebrum	A. Primary Zone-Motor projection-acts upon plans B. Secondary Zone-premotor level-acts as an organizing agent C. Tertiary Zone-prefrontal area-formulates plans

"makes sense" out of the deluge of sensory information provided by the body's sensory organs. Block 1 serves an obvious purpose in that to carry out any conscious human activity, the mind must be in a wakeful and aroused state in order to process information. Block 2 is the area of the brain which has thus far received the most attention, particularly in the field of reading since here is where complex information processing such as inferencing in reading comprehension must be coded. The individual is dealing with serially presented information in terms of print and the syntactic forms of language, but in order to follow the arguments and "get the gist" the reader must be able to deal with the spatial arrangement of logico-grammatical relationships. Block 3 may hold a great deal of promise in terms of a complex area such as reading comprehension which, in its highest or more mature form relies heavily on planning and purpose and it is this aspect of information integration that the current research is designed to explore.

The three areas of the brain under consideration in this model of information processing each have three levels of processing nested within them, in hierarchical fashion. Thus, simultaneous processing, controlled by the occipital and parietal lobes has a sensory level dealing with visual, olfactory, and tactile information; a mnestic or memorial level involved with speech and writing; and an intellectual level dealing with mathematical and logico-grammatical relationships. These three levels are interactive rather than discrete.

Similarly, the successive component, controlled by the temporal lobes consists of a sensori-motor level dealing with such functions as the auditory and motor production of spoken words; a mnestic function which would be involved in following verbal directions of a multiple nature; and an intellectual level which interacts with the mnestic function to carry out thinking activities.

Finally, the planning and decision making component found in the anterior to central sulcus of the frontal area of the brain has a motor projection level; a secondary pre-motor level which serves as an organizing agent; and a pre-frontal area where plans are formulated. The secondary and prefrontal areas are responsible for the formation and organization of intentions and plans which are then passed on to the motor projection area to be acted upon. Luria says of this frontal area:

> the frontal lobes not only perform the function of synthesis of external stimuli, preparation for action and formation of plans, but also the function of allowing for the effort of the action carried out, and verification that it has taken its proper courses (1973, p. 92).

In this active processing of information, the frontal lobe area deals directly with searching for the most important aspects of the information, the relevant cues; comparing each part of the information; creating hypotheses related to the meaning of the data as a whole; and verification of hypotheses by comparison with the original features of the perceived object.

In terms of the model of information integration (Figure 2.2), the planning or executive function and its interdependence with simultaneous and successive synthesizing, is obviously crucial. Stimuli are transmitted to the sensory register and passed to the central processor which comprises a simultaneous, a successive, and a planning component. The processing in the two coding components would appear to be independent of the nature of the sensory input. Simultaneously presented information such as a visual representation could be processed successively and successive information such as auditory input might be dealt with in a simultaneous fashion. Ashman (1978) notes that the choice of coding depends on two things: firstly, the individual's usual practice which may be both socio-culturally and genetically determined; and secondly, the demands of the task. He concludes that there appears to be a cognitive process which "intermediates" use of a particular strategy and that this process is likely to be one of "planning and decision making."

The theoretical basis for further research into this planning component comes from Luria's observations of patients with frontal lobe damage, who appeared to have planning deficiencies. Luria notes:

> the frontal lobes (and in particular their medial zone) constitutes the cortical apparatus regulating the state of activity and they play a decisive role in the main-

> tenance of one of the most important conditions of human conscious activity--the maintenance of the required cortical tone and modification of the state of working in accordance with the subject's immediate tasks (1973, p. 197).

Obviously plans and intentions are particularly important in complex human activities where the organism must be able to withstand distracting and irrelevant stimuli. Luria found that it was in the higher forms of organized conscious activity, that is, those which are most purposive or "intentional", that were most likely to be affected by lesions in the frontal area of the brain.

Advances in neurometrics (Coleman, 1976; Shagrass, 1972), using the electroencephalagram to measure alpha rhythms, indicates the presence of "a decision making wave" (Restak, 1979). This seems to strengthen Luria's (1973) hypothesis that research examining evoked potentials with frontally damaged patients might confirm the role of the frontal lobes in "vigilance", as part of the executive aspects of directing attention. Donchin (1979) discussed the use of the P300 wave as a measure of cortical activity. The measure of the P300 wave in relation to decision making activities indicates "that we are dealing with an intrinsic cortical process that is evoked by the task demands of the situation rather than by specific inputs to the system." The brain then, must actively plan and intend to respond and as such "is a dynamic system that continuously generates hypotheses about the environment that are then validated against input information" (Donchin, Cited in Restak, 1979, p. 45).

While affective or personality ramifications of this particular paradigm will be more extensively dealt with in a later section, it must be mentioned that both Yarbuss (1967) and Ashman (1978) address themselves to the relationship between impulsivity-reflectivity and planning. Luria (1973) talks of perception as being active rather than passive and notes that this activity is mediated by the frontal lobes. Yarbuss (1967) in examining the eye movements of subjects with frontal lobe dysfunctioning found that subjects could still recognize simple pictures, words, and sentences (and hence were still able to simultaneously and successively synthesize in a limited way). However, when they were presented with a complex task, their visual scanning became passive and subjects were apt to respond impulsively.

Similarly, Ashman (1978) added an impulsivity-reflectivity test (Matching Familiar Figures Test) to his battery of tasks designed to examine the relationship between simultaneous and successive synthesis and planning. This personality dimension would appear to be related to simultaneous processing.

Luria talks of the role of the frontal area of the brain in relation to memory (1973). Soviet psychologists would seem to concur with their western counterparts that memory is a complex, active process involving: (1) optimal cortical tone or a state of total vigilance; (2) a stable interior; (3) the coding of incoming or afferent information in an analytico-synthetic fashion in which the relevant cues are selected to be reassembled; (4) and finally an integrative action. While "memory" comprises a significant area of cognitive research unto itself, and is the subject of a wide range of theorizing, suffice it here to say that in the integration of simultaneous and successive synthesis with the planning and decision making component, the role of memory is essentially that of reorganizing and restructuring incoming information.

In summary a number of points must be emphasized. The work of Luria and other Soviet psychologists such as Zavarazin (1944); Bekhterev (1907); Sorkina and Homskaya (1932); (all cited in Luria, 1966), have been based almost entirely on observation of patients with lesions in various parts of the brain. The works of Das (1973) Das, Kirby, and Jarman (1975) Das, Jarman, and Kirby (1979) Cummins and Das (1977) Cummins (1973) McLeod (1978) Ashman (1978) and Ryckman (1981) have relied on correlational and factor analytic interpretations of tasks which apparently "tap" simultaneous, successive, and planning components (see Figure 2.3). The present writer and the reader must acknowledge that at this point in time, the state of Luria's particular paradigm is still undergoing exploration and revision. For instance, McLeod (1978) in testing aspects of the information integration model of Das, Kirby, and Jarman (1975), noted the need for a complex feedback

FIGURE 2.4

Measures of Planning, Successive Synthesis and Simultaneous Synthesis

Measures of planning

1. Visual search task
2. Trail making task
3. Planned composition
4. Syllogistic reasoning

Measures of Successive Processing

1. Digit Span
2. Auditory Serial Recall

Measures of Simultaneous synthesis

1. Raven's Progressive Matrices (simultaneous)
2. Figure Copying (simultaneous)
3. Memory for Designs (simultaneous)

system. McLeod in a revised model includes such a feedback system. Another criticism of the 1975 model is that it represents information integration as passive, and unidirectional. McLeod (1978) observed that there was a need to explore the efferent nature of the information integration model in relation to reading. As a result of his research he concluded that:

> inference is dependent upon the psychological functions of formulating intentions and programs, and decision making (i.e., which information to use for an inference, and when to stop inferencing). Luria has identified these functions with the frontal lobes of the brain. Research methods for measuring the levels of development in these functions is much needed to explore further their relationships to the process of inference. (McLeod 1978, p. 250-251).

It is the contention of the writer that perhaps exploration of planning and decision making components of the model may contribute to reconciliation of certain apparent "weaknesses". Indeed, as Wittrock (1978) in a cogent synopsis of neuropsychological research to date writes:

> One of the most interesting summary findings about the brain is that it actively constructs models of the world. Luria and Trevarthen also find that the human brain actively selects, transforms, and remembers information. The neural structures of the brain stem, midbrain and cortical hemisphere not only receive and respond to sensory and somatic information, but these brain structures actively influence the selection and interpretation of information as well. The plans and intentions of the frontal lobes influence encoding, selective attention, and arousal. The descending reticular system exerts a decided effect upon arousal. The orienting response selectively directs attention to environmental information. Learners are not passive recipients of the information presented to them. They actively construct their own meanings from the information they are taught (Wittrock, 1978, p. 64).

In this clear but precise summary of neuropsychological research as it relates to brain functioning, the connection between the fluent reading act and thinking become clear. If reading is an active rather than passive activity requiring selective attention to cues generated at the graphic, semantic and syntactic levels one can see the importance of block 3 functions in establishing the cortical tone required in setting the stage for reading to begin.

If the fluent reader is an information processor who codes the incoming information in a manner appropriate to the task demands in either a successive (temporal) or simultaneous (spatial) manner, the importance of block 2 functions becomes apparent.

Finally if the fluent reader is an information processor who constructs a plan to guide his reading while constantly confirming and rejecting hypotheses based on expected as well as confirmed information one can see the vital role of block 1 functions in gaining meaning from print. Block 1 would also, as a regulator, tell the reader when he has collected enough information to stop hypothesizing.

It must be remembered that the neuropsychological perspective of brain functioning articulated here does not view blocks 1, 2, and 3 as being discrete, but rather regards them as part of a dynamic and interactive system. As such, the individual's personal style and preferred mode of approaching the task at hand will affect his performance in task specific reading activities. This preferred mode may be both genetically and socioculturally determined.

Other Views of Planning

Metacognition

Vygotsky (1962) outlined a two part framework of knowledge development. Part I was automatic and unconscious whereas Part II involved the ability to consciously control the knowledge that had been acquired. Here is the first hint of what has become a vigorously researched field —— (Brown, 1975, 1977(a), 1977(b); Brown & Deloache, 1977; Flavell, 1976, 1977).

Flavell (1976) explains:

> Metacognition refers to one's knowledge concerning one's own cognitive processes and products or anything related to them . . . to the active monitoring and consequent regulation and orchestration of these processes in relation to the cognitive objects or data on which they bear, usually in the service of some goal or object (p. 232).

Flavell (1976, 1977) sees cognition as an active process involving the individual in two ways; first as a participator in a cognitive event and secondly as an observer of the event. It is the second aspect of the cognitive experience involving monitoring, regulation, and arrangement of information which Flavell refers to as metacognition.

This self-regulating awareness has a developmental component to the extent that children appear to be less metacognitively aware than adults. Piaget (1929) and Vygotsky (1962), have also noted this phenomenon. Moreover, beginners at a particular cognitive activity may experience difficulties in task performance not only because they lack certain cognitive skills that would be useful in dealing with the problem but because they lack the metacognitive "where-with-all" to regulate their own behaviours.

Brown and Deloache (1977) comment on this aspect of metacognition by saying:

> The novice tends not to know about either his capabilities on a new task or the techniques necessary to perform efficiently; he may even have difficulty determining what goals are desirable, let alone the steps that are required to get there (Brown & Deloache, 1977, p. 21).

Sternberg (1983) attempts to classify metacognitive processes. Since it is widely accepted that metacognitive skills include those related to executive functioning it is not surprising that he lists problem identification, process selection, strategy selection, mode of presentation selection, allocation of resources, solution monitoring, feedback sensitivity, translation of feedback into an action or plan and implementation of the action plan as metacognitive skills.

Perhaps most relevant to the present study is Lawson's (1980) explanation of metacognition as a monitor and regulator of information processing strategies. Such a view suggests a link between metacognition and Block III functions of the brain as defined by Luria (1966a). Equally important to the present study is Brown's (1978) view that metacognitive awareness is linked with a host of variables including personality, social interactions, and motivation. Brown goes on to suggest that metacognition requires the ability to introspectively consider and evaluate one's performance.

Metacognitive research appears to be relevant to the present study not only as it might relate to Block 3 brain functions as described by Luria (1966a), but also as it relates to the dynamic and interactive view of the individual as reader proposed by the researcher and to the analytical introspective/retrospective data collection techniques employed.

Scripts, Plans and Goals

Another view of planning is that proposed by Schank and Abelson (1975, 1977).

Schank (1969, 1972, 1973) has attempted to represent utterances in terms of underlying concepts while Abelson (1973, 1975) has dealt with simulating interactive communications. Together they have produced a computer simulation which explains the understanding of short narratives. However, they contend that the type of understanding explained by the short narratives has broader implications which relate to everyday life.

Although extremely technical in nature, their explanation of this social knowledge has five aspects: conceptual chains, scripts, plans, goals, and themes. Of particular relevance to the present discussions are scripts, plans and goals.

Schank and Abelson (1977) say of scripts:

> We use specific knowledge to interpret and participate in events we have been through many times. Specific detailed knowledge about a situation allows us to do less processing and wondering about frequently experienced events. We need not ask why somebody wants to see our ticket when we enter a theater or why we should be quiet or how long it is appropriate to sit in one's seat. Knowledge of specific situations such as theaters allows us to interpret the remarks that people make about theaters. (Schank & Abelson, p. 37)

Other scripts might deal with taking a bus or having a meal at a restaurant.

By using scripts, the individual resorts to a set of rules which are learned through his cultural and institutional heritage. Since other members of the society will have similar scripts available to them, a set of rules and regulating measures prevail among members. Options of various kinds are also available within a script. The point is that in many situations all participants are aware of what is expected of them.

Scripts can explain recurring situations in which the individual finds himself. New situations, according to Schank and Abelson, can be explained in terms of goal oriented plans, the mechanisms which underlie scripts.

Plans consist of a series of sub-goals or delta goals (D-goals) aimed at achieving the overall goal which initially generated the plan. Each sub-goal or D-goal contains what Schank and Abelson refer to as a planbox. The planbox contains the cultural/institutional/personal knowledge required to achieve a D-goal. The planbox could also contain scripts as well.

If a script is available, a given situation may be dealt with in a straightforward almost ritualistic manner, similar to the theater example mentioned previously. In unfamiliar situations, however, when D-goals and planboxes are required to achieve an overall goal, the personal component involved in selecting the appropriate ways to achieve interim D-goals could profoundly affect the outcome in terms of the broader goal sought. It is this personal element which would almost surely influence the reader's planning behaviour when encountering an unfamiliar text.

Planning and Reading

One method of explaining how planning might influence the way the reader interacts with the text is outlined in the schema theory of Rumelhart and Ortony (1977).

The term schema around which their theory is developed is not new. It appears in the psychological writings of Bartlett (1932) who credits the term to Head (1926). In describing schema theory Rumelhart (1981) explains

> A schema theory is basically a theory about knowledge. It is a theory about how knowledge is represented and about how that representation facilitates the use of the knowledge in particular ways. According to "schema theories" all knowledge is packaged into units. These units are the schemata. Embedded in these packets of

> knowledge is, in addition to the knowledge itself, information about how this knowledge is to be used. (Rumelhart, 1981, p. 4)

Through the use of analogy, Rumelhart compares schemas to the scripts of plays, to theories, to procedures and to parsers. In so doing, he explains that schemas provide a framework on which the sense of a situation hangs, but they allow for a myriad of minor variations within the overall framework. He stresses the point that the schema consist of sub-schemata which in turn break down to the essential constituent elements of the schema which Norman and Rumelhart (1975) term primitives.

To the extent that schemas, several of which are called schemata, help us understand the world in a theoretical sort of way they have predictive value in terms of hypothesis testing and evaluation which aid in dealing with both observable and unobservable events.

Rumelhart (1981) explains that schemata are active rather than passive processes and in terms of internal structure are clearly defined. He notes:

> Procedures normally consist of a network (or a tree) of sub-procedures. A particular procedure normally carries out its task by invoking a pattern of sub-procedures each of which in turn operates by invoking its sub-procedures. Each procedure or sub-procedure can return values which can serve as conditions determining which if any further sub-procedures are to be involved. So it is with schemata. (Rumelhart, 1981, p. 11)

To the extent that schemata are responsible for selecting appropriate information and for interpreting events in a searching and unifying type of function, they are according to Rumelhart, like parsers.

In a summary of the major features of schemata Rumelhart (1981, p. 13) notes the following:

1. Schemata have variables;
2. Schemata can be embedded, one with another;
3. Schemata represent knowledge at all levels of abstraction;
4. Schemata represent knowledge rather than definitions;
5. Schemata are active processes;
6. Schemata are recognition devices whose processing is aimed at the evaluation of their goodness of fit to the data being processed.

Schemata can be activated in a top down (schema to sub-schema) or bottom up fashion (sub-schema to schema). Thus Rumelhart's model of reading comprehension which is based on the schema as the organizing, evaluating and controlling agent is not top down or bottom up but is in the truest sense of the word dynamic and interactive.

Another notion of planning, as it relates to reading, is that articulated by Bruce (1977) and Bruce & Neuman (1978). The latter have devised a system which goes beyond explaining simple plans or the plans of one character in a conversation, story, or social situation to offering an explanation of how plans of characters interact.

Interacting plans are always more complex than individual plans because a character may formulate a plan to dissuade or deceive the character with whom he is interacting. As such the actual goal of such a plan and the subsequent actions involved in carrying it out serve a purpose other than the readily observable or perhaps stated one.

In one notable example Bruce & Neuman (1978) analyze the text of Hansel and Gretel showing how complex the nature of interacting plans can be. Although not claiming to provide a model of social interaction, the suggestion is made that such analysis of story structures can aid in explaining the social interactions underlying certain texts. In explaining the nature of their research to the field of reading Bruce and Neuman suggest that:

> The complexity of plans may mean that readers can understand in different ways, yet still be reading, and hence, learning to be better readers. Furthermore, the importance of critical beliefs suggests that readers with different backgrounds may build different interpretations of the same texts. It is a characteristic of interacting plans and we think of literature in general that one can uncover multiple meanings, no one of which is wrong or even unsatisfying. (Bruce & Neuman, 1978, p. 79)

With regard to planning, other researchers like Mackworth (1977) talk of the reading act as one which is concerned with the "self supervision" of the possible ways to process rather than merely the processing itself. Milner (1964) and Luria (1966) have already noted that self critical activities are directly controlled by the frontal lobes. Pribram (1971, 1973) talks of the key role of the frontal system in regulating or segmenting a series of novel events.

The frontal lobes have an on-going supervisory or executive function which maintains a running analysis of actions and thoughts to keep the main intention uppermost. The planning component is thus likely to ease the load on short term memory, in what might be conceived of as a "filtering process". Mackworth (1977) writes:

> An external trend in the environment must at least temporarily be stored in the brain as a neurological context against which further stimuli can be compared. External environmental context becomes an internal neurological context or the organism is stimulus bound. Prediction from experience cannot come through a narrow short-term memory window. (Mackworth, cited in Wanat, p. 20)

Bakker (1972), Blank, Weider, and Bridner (1968) and Goodnow (1971) all note the role of short-term memory in reading. The planning, intention or executive organization controlled in the frontal area of the brain facilitates the processing of relevant stimuli thus keeping the reader directed toward his goal.

It may be this control, this intention-monitoring-attention, that is likely to play a key role in the reader's achieving the highest levels of Gray's (1956) mature reading. Calfee (1974) notes that "individual differences within an age level . . . reflect variation in control processes more than variation in memory structure per se" (Calfee, 1974, p. [illegible] In reading, as in many other higher order cognitive activities, it is knowing "what" you have to do as well as knowing "how" to do something that is important. It is this metacognitive awareness discussed earlier (Flavell, 1976, 1977) that is likely to be crucial in an active process like reading.

Mackworth (1977) notes that in skilled mature reading the role of habituation (via attention) cannot be underestimated.

> Skilled reading is characterized by effective prediction. People seldom look, without looking forward in time. They have decided where they will look next before they move their eyes and have also decided what they expect to find when they do make a visual leap onto the next object or word. (Mackworth, cited in Wanat, 1977, p. 4)

In terms of reading as a purposive, intentional "choice" behaviour Mackworth observes:

> The brain predicts what will come next in the stream of words and the eye selects the area that will confirm or deny the prediction. (Mackworth, 1977, p. 4)

Calfee discusses the element of planning or intention, the executive or organizing component of information processing, as the key to understanding individual differences in reading. With specific reference to Gray's (1956) model of the mature critical reader, the writer concurs with Calfee who writes:

> response style may critically affect observable performance. How fast he, (the individual as reader in this case) selects and answers whether he checks the alternatives carefully, whether he checks his memory at all, these reflect processes that intervene between any knowledge in memory and actual test performance. (Calfee, 1974, p. 76)

Judd and Buswell commented on the organizational abilities required in fluent reading when they wrote in the 1920's:

> a printed page turns out to be . . . a source of mass impressions which the active mind begins to organize and arrange with reference to some pattern which it is trained to work out. (Judd & Buswell, 1922, p. 4)

This organizing and arranging appears to involve synthesis and restructuring not only on a word phrase level, but on a mental level for meaning as well.

Finally, Neisser (1974) notes that many models of reading look at the "idealized reader", ignoring differences in background experience, social, cultural and linguistic differences as well as factors related to purpose and cognitive style. He writes:

> the perceiver is an agent and not "an idealized system." Thus, cognitive psychologists should not limit themselves to what the individual perceiver 'knows'. Rather, they must also take into account "who the individual perceiver is, what he wants to do, and what his strategies are in approaching the task." (Cited in Wanat, p. 41)

It is exactly this type of criticism that the current research with its emphasis on the reader as individual, has tried to address.

Decision, Choice and the Nature of the Individual

Because the human organism is constantly acting on, interacting with, and reacting to the environment, it is never completely at rest. Biologically, perceptually, cognitively, and affectively, man is in a constant state of flux. As he moves from the past through the present and into the future, one thing is certain--things will change. Although transition and change are more acutely observable over a span of time, it would be intellectually naive to dismiss the host of minute and subtle transformations which are continually altering the totality which is collectively the human being.

To cope with his ever-changing world, man requires a considerable number of resources. First of all, it is necessary to collect and gather data from the unlimited supply of sensory input which exists in the environment. Secondly, the data collected must be organized and coded in some way so as to reduce the colossal number of courses of action which are ultimately available to him. Thirdly, some general rules must be formulated to aid in short-cutting the extended processing of all information collected--that is, some rules, predictions, or hypotheses must be evolved and tested based on the sampling of cues gathered from the environment. Finally, the individual must know when to stop collecting information. He must know when he has sufficient data to confirm or reject his hypotheses. In essence, he must know when to seek closure, to make a decision based on the facts and having done so, to initiate the entire process over again. As Audley (1971) states:

> We might therefore consider the possibility of formally representing real decision makers as collecting information until an adequate amount is available to justify one action or another. (Audley, 1971, p. 60)

In an endeavour to avoid the psychological complexities involved in the study of decision making, Morris (1972) explains that we have witnessed the development of "highly rationalistic and pseudo-logical models requiring one to externalize the decision process in terms of some seemingly sensible steps" (Morris, 1972, p. 192). The problem with this logical approach is that it assumes the individual recognizes the problem, evaluates the probable alternatives and then with an eye on the possible outcomes makes his choice. In all probability this is an over-simplification of the situation. At least a part of man is illogical, irrational, and unsystematic. Any explanation of the decision making process must take these facts into account. It is the contention of the writer that a more realistic approach to the study of decision and choice would involve the assessment of aspects of what one might refer to as an individual's personal style. In this way the decision making process becomes removed from the rational/irrational dichotomy that has plagued it in the past and is placed into the subjective context of the individual and the multiplicity of forces which push and pull to shape his behaviour. It then becomes possible to speculate on some characteristics of human functioning which could be of value to the individual as a decision maker.

It is these characteristics that will be examined in the next section.

Factors Affecting Decision Making

One of the conditions of great import to effective decision making would appear to be self-awareness or knowledge of self. The cluttered mind is home to a considerable number of distractions which can muddle and confuse even the most simple issue. Almost everyone has been confronted with a situation where he has had to make a commitment to a course of action while under duress. Such decisions are usually regretted afterward as some personal reflections will almost assuredly confirm.

Eastern religions like Buddhism and Taoism have long recognized the importance of self-awareness in allowing the intuition to function without constraint. The "know thyself" notion is developed through a process of concentration, meditation, and contemplation, which leads the individual to a broadened state of self-awareness and self-understanding. Current psychological research into metacognition which has been discussed previously, tends to support this contention.

One obvious benefit to be gained by raising the decision maker's level of consciousness is that it eliminates a considerable amount of "noise" and allows a clearer perception of the situation. As Festinger (1964) has noted:

> There are times when a person makes a decision, even an important one, very quickly, without considering much information about the alternatives. There are even instances when, after careful and thorough consideration of information about the alternatives, the person seems to make the decision on the basis of some minor, almost trivial aspect. We have little understanding at present of when, and under what conditions, such impulsive decisions are made. (Festinger, 1964, p. 154)

It seems, therefore, that increasing an individual's self-awareness could have a profound effect on his decision making behaviour. Confronted with an overwhelming amount of "noise" and wishing to resolve the issue at hand the individual might choose to terminate the conflict by making an impulsive decision. Moreover, research has shown that impulsivity is a characteristic behaviour of certain types of people (Kagan, 1971). It is significant to note, of course, that though conflict reduction may be the temporary result of a hasty choice, post decision dissonance (Festinger, 1957) might more than offset the brief hiatus from frustration enjoyed by the individual. As Lewin (1951) notes:

> A process which takes only a few minutes is able to affect conduct for many months to come. The decision links motivation to action, and, at the same time, seems to have a "freezing" effect which is partly due to the individual's tendency to "stick" to his decision. (Lewin, 1951, p. 233)

The conflict/dissonance hypothesis is an interesting one. Lewin (1935) and Miller (1944) see the predecision period as one involving conflict. The individual reacts to this period of frustration by becoming angry, by withdrawing, by lashing out in an aggressive manner, or by adopting some other form of behaviour which indicates that "all is not well". After making the decision a respite of stability ensues. This is followed according to Festinger (1957) by a period of dissonance during which an attempt is made to justify the decision that has been made. Festinger also feels that "the greater the conflict before the decision, the greater the dissonance afterwards" (Festinger, 1964, p. 5). If this is so, one pays a heavy price for the hasty decision. What is gained by reducing predecision conflict is paid for by postdecision dissonance and the impulsive decision maker would be especially affected. A factor which could be closely related to impulsivity in decision making is the capacity of the individual to tolerate ambiguity. An inability to handle ambiguous stimuli could result in decisions being made before all alternatives have been examined. Closely related to this conscious examination of alternatives is the ability of the individual to retain an openness to the problem until all data has been collected. This flexibility would appear to be a crucial factor in the decision/choice situation. To the extent that cognitive flexibility is seen by some researchers (Guildford, 1955a, 1955b, 1957; Mackworth, 1965) to be related to creative thinking, some interesting speculations are fostered. Perhaps the greater self-awareness of the creative thinker allows him to be in tune with the basic needs and desires which are constantly distorting his perceptions of a problem situation and producing noise. Conversely the less aware and more rigid individual might be resorting to habitual ways of making decisions in an effort to reduce processing load and "save face". Such an approach would serve two purposes. First of all, it would reduce the number of decisions to be made by creating generalizations anchored in conventions and routines. Individuals for whom the conflict/dissonance decision making situation is particularly traumatic could then completely avoid it. The mind would be made up according to a pre-arranged format. Perhaps this is the set of circumstances which prompted Audley to comment: "Minds appear not to need making up; it is unmaking them which takes time and evidence" (Audley, 1971, p. 62). The other consequence of such an approach would be in terms of justifying the decision after it was made--that is in reducing dissonance. The individual could say in defense of his choice "this is the way I've always done it." There is some research evidence to show that this may be exactly what is happening during problem solving. Ohnmacht (1966) and Zawel (1970) have reported that some individuals display difficulty breaking learning sets, adopting strategies which have been effective in one learning situation and applying them inappropriately to another.

Another factor which serves to complicate the decision making process is the fact that an individual is likely to see a situation the way he would like it to be rather than the way it actually is. Our perceptions are coloured by what we expect to see as much as by what is truly present. According to Bartlett (1958):

> The thinker, approaching the situations which provoke him, is always predisposed in favour of some conventional comments and against others. Often he appears to adopt as his own, without any further examination, the first conventional generalization

> current in an approved social group, which "comes to mind" as we say. But "comes to mind" is a joint result of what the mind wants, and what the circumstances offer with the former playing a dominant role. (Bartlett, 1958, p. 182)

Elsewhere, Bartlett (1932) has discussed this phenomenon under the rubric of importations, which he explains are biases external to the problem situation but which have a profound effect on the outcome. Richards (1929) sums it up quite succinctly when he says regarding man:

> The desire to condense his past experience, or to invoke doughty authority, in the form of a critical maxim, is constantly overwhelming. (Richards, 1929, p. 296)

If habitual behaviour and wishful thinking do not sufficiently distort the view of the decision making situation, perhaps the individual's cultural bias will. As Morris states:

> Conceptions of choice situations get distorted because of the social and organizational processes that lead a person to view things in ways accepted by his associates. Socially shared views which come not so much from contact with reality as from the need to agree, to belong, or to avoid questioning the views of a group--are a part of most decisions. (Morris, 1972, p. 200)

Bartlett (1932) agrees that cultural factors profoundly affect the individual's thinking and Neisser (1976) discusses the importance of cultural schemas in human thought processes. Awareness of those variables which strongly influence the thinking and decision making power of the individual are terribly important if research in this area is to continue with relevance and credibility.

Other investigators such as Luria (1966) and Das, Kirby, and Jarman (1975) have outlined the importance of the frontal lobes of the brain in goal direction and planning, while others (Coleman, 1976; Shargrass, 1972; and Restak, 1979) are investigating decision making behaviour in the area of neurometrics.

It is possible that in combining the domains of psychology and physiology we will come to a greater understanding of not only human decision making but human functioning in general. Hebb (1949) sums it up thus:

> The method then calls for learning as much as one can about what the parts of the brain do (primarily the physiologist's field), and relating behaviour as far as possible to this knowledge (primarily for the psychologist); then seeing what further information is to be had about how the total brain works, from the discrepancy between (1) actual behaviour, and (2) the behaviour that would be predicted from adding up what is known about the action of the various parts. (Hebb, 1949, p. xv)

Certainly there is no question that many important factors which shape the character of the individual are not a matter of choice. One cannot, for instance, choose one's race, sex, culture, or place of birth. However, in the day to day activity of living there are countless choices and decisions which have to be made. Of these, some may be handled by the reflex arc or cell assemblies (Hebb, 1949). Others, however, require a high level of consciousness and demand analysis, reflection, and planned direction. Such is the nature of the decisions involved in the fluent reading act. At the same time, most of what is decided will of necessity be affected by biases resulting from habit, distorted perceptions, or factors related to the social, cultural, and political context in which the individual functions. As Richards (1929) has noted:

> Every response is "subjective" in the sense that it is a psychological event determined by the needs and resources of a mind. (Richards, 1929, p. 326)

It is for this reason that statistical models, systems models, or models based on economic utility theory, cannot hope to entirely explain the human decision making process. As Bartlett (1958) so aptly described:

> The skills of the body are attached to the demands of the world of the moment, but thinking can meet those far away in any direction and even those which have no time or place. (Bartlett, 1958, p. 200)

There is no question that situational factors play a key role in matters of choice. Personal reminiscence reveals that decisions made in adolescence are not appropriate in adulthood. Similarly decisions made in one learning situation may not be appropriate in another. Some investigators like Cassel (1973) feel, that like other psychological processes, the ability to make decisions is learned. It is his contention that skill in the area can be fostered by providing organized experiences which coincide with a person's psychological development. The writer maintains that a great deal can be learned about the decision making process by uncovering, through qualitative research, characteristics which are indicative of the individual's personal style. The rubric "personal style" includes perceptual, and personality, as well as what have been traditionally referred to as cognitive variables.

Finally, there are a number of promising developments in neurological research which may provide some important insights into the complex area of human decision and choice.

Of key interest to the writer is the extent to which decision making abilities affect performance in highly specific information processing activities such as reading. It is this issue that will be discussed in the following sections.

The Fluent Reading Act

The act of fluent reading as viewed by the writer is the result of a continuous developmental process and as such involves:

> a complex of facilitating acts and skills closely interwoven with speech and writing--not ends in themselves but communicative means to personal and social maturity, to the ultimate ends of education and of humanity itself. (Lefevre, 1964, p. 291)

Moreover it is felt that the fluent reader comes to understand the text through a process of sampling, predicting, and confirming in a simultaneous and successive manner. In this way the reader reduces his uncertainty and gains information.

> If we regard reading like any other process of acquiring information which tends to reduce uncertainty, then we have discovered the first way in which the conventionally disparate areas of letter identification, word identification, and "reading for comprehension" can be considered in the same light. In

> each of the three aspects of reading, information is acquired visually to reduce the number of alternate possibilities. (Smith, 1971, p. 18)

In an effort to reduce his uncertainty, the fluent reader must take an active and participatory rather than a passive and spectator role to the task at hand. He compels answers from the text and arrives at meaning, the goal of all reading activity. Gray (1960) in a model outlining the reading process summed up the notion of comprehension when he described it as "the ability to read the lines, to read between the lines, and to read beyond the lines" (Gray, 1960, p. 12).

It was his contention that the fluent reader is always affected by what he reads. Thus he is forced to speculate on:

> the significance and implication of the author's ideas as contrasted with what he said. . . . At this level he may react with a smile or a chuckle or experience a feeling of pleasure or sorrow, or of approval or disapproval. The nature and intensity of these reactions depend largely on the reader's interests, background of experience, and his attitudes, biases, and perceptions. (Gray, 1960, p. 17)

Here Gray alludes to the notion of schemas, a term which, as previously noted, appears so frequently in the literature (Bartlett, 1932; Head, 1926; Pearson, 1978; Rumelhart, 1975). In the current orientation to fluent reading described by Ramey and Mitchell (1979, Figure 2.1) the term has a more global connotation and includes not only background knowledge in terms of language, verbal concepts, and familiarity with text, but the sum total of all factors which describe the reader. As such the description given does not fall conveniently within the "top down" or "bottom up" classification of reading models (Levy, 1977) but is instead interactive and on-going.

Finally Gray refers to "the mental synthesis of new ideas." This fusion involves:

> assimilation and . . . fusing the ideas acquired through reading with previous experiences . . . . Many mental processes are involved in fusing the old, such as analysis, comparison, selection, synthesis and judgment . . . creative thinking. According to psychologists it is the highest of all the higher mental processes. It involves the imaginative treatment of ideas in both inductive and deductive thinking and results in new insights, fresh ideas, and new organizations or patterns of thought. (Gray, 1960, p. 19)

Robinson (1966) has revised Gray's model adding Cleland's (1965) "application component" in terms of doing something with the information collected and Smith's (1965) notion of reading for a purpose. Indeed, it is the writer's opinion that only by considering all elements involved in a purposive activity (arousal, attention, motivation) can one truly understand how the mind processes information. As Stauffer (1977) notes:

> One can conclude that "purpose for reading" like "intention in thinking" is crucial to comprehension. This being so, a teacher is obliged to nurture the inquiry process so that readers develop an active intelligence capable of projecting, weighing evidence, making critical decisions, and doing constructive research. This is so because critical reading, like critical thinking, requires cognitive interaction between facts, their values, and consequences, between hypotheses and proofs, resulting in the internalization of knowledge and the acumen of self-regulation. (Stauffer, 1977, pp. 242-243)

It was this view of the reading act which influenced the researcher in designing the reading tasks (SRUR, SRIR, SRSR) which were utilized in Phase II of the current study.

Indeed many writers have alluded to the strong bond between critical thinking and fluent reading. Huey (1908) felt the reading processes mirrored "the process of thinking". Thorndike noted:

> Understanding a paragraph is like solving a problem in mathematics. It consists of selecting the right elements of the situation and putting them together in the right relations, and also with the right amount of weight or influence or force for each. (Thorndike, 1917, p. 329)

Gray (1956) in describing the "mature reader" observed that he or she knows not only "how" but also "when" to

> skim or to read closely, to read rapidly or to linger, to get a general impression, or to master details, to read orally or silently, when to reflect, to visualize, to infer, to evaluate, or when to use any of the other skills and abilities one has acquired. (Mackworth, cited in Wanat, 1977, p. 4)

Finally, Stauffer (1976) traces the method of scientific thought from the work of Descartes (1619) through Locke (1690) to Kant (1787), Dewey (1933), and Piaget (1958) with the conclusion that these philosophic developments initiated what can be called the "reading-thinking process". He concludes:

> Man must not only examine his universe but more important must examine his way of looking at it. He must be intellectually critical, speculative, and reflective. Similarly when reading, man must be attentive to the facts, not to tabulate them, but to determine their relevance and consequences. The reader must establish the primacy of thought as the touchstone of recorded knowledge. (Stauffer, 1976, p. 5)

A number of scholars appear to agree that speculation, reflectivity, and critical examination are the prerequisite skills required for initiating the plans and intentions so crucial in higher order creative thinking. Flavell (1963, p. 204) describes the creative individual as one "possessing a solid cognitive bedrock, something flexible and plastic and consistent and enduring." Monod (1971) describes man's intellectual pursuits as being:

> conscious and projective, intentional and purposive--the artifacts he makes are products of a planned purposefulness as opposed to the products of nature which are neither planned nor purposive. (Monod, cited in Wanat, 1977, p. 51)

Dewey (1933) describes reflective thinking as emancipation from impulsive activity while Wertheimer (1945) in his discussion of productive thinking, Peel (1961) in his description of integrative thinking, and Bartlett (1958) in his articulation of adventurous thinking all acknowledge the role of intention as essential to the higher thought processes.

In relation to the field of reading Huey (1908) alludes to reading for a purpose through the choosing of relevant information as requiring a mental discipline that is based on the "training of judgment". Gates (1949) describes reading as a thoughtful process which should apply to all types of thinking while Stauffer (1977), Goodman (1976), Smith (1971), and Pearson (1978) see reading as a process of sampling, predicting, and confirming. It is the notion of planning, confirmation, and decision making in fluent reading which is of particular interest to the writer. Because to read well is to think well, we might more accurately talk of the reading/thinking process than the reading process in isolation. Through a continuous process of sampling, predicting, and confirming hypotheses the reader becomes a winner in a "triumph against odds" (Richards, 1929). Fluent reading is the acme of the reading act and is the result of a continuous process. Therefore, "we are all of us learning to read all the time" (Richards, 1929).

The Importance of Coding, Planning, and Decision Making in Fluent Reading

Latham describes reading in terms of a decision making process. Comprehending connected strings of words can be conceived as a succession of decision making postponements.

> Decisions are likely to be "suppressed" until the word elements in the visual array can be synthesized into a cohesive unity. This cohesion is provided by the interaction of syntactic and semantic factors, jointly interacting with situational and experimental influences provided by both the writer and the reader. (Latham, 1973, p. 4)

It appears then, that the reader predicts in an anticipating fashion utilizing both visual and nonvisual information sampled, to simultaneously synthesize language units (based on syntactic information) with verbal concepts (based on semantic information). By maximal integration of the semantic and syntactic information available, the reader decreases the number of decision making events needed to confirm the predictions that have been made in an effort to reduce his uncertainty. Latham argues that the synthesizing process involved in reading is hierarchically arranged with lower levels or chunks synthesized into higher levels of sentence or discourse reconstruction. This is not unlike Kintsch's (1978) explanation of micro-propositions and macro-propositions where the ultimate goal is "getting the gist".

McLeod (1978) has viewed cognitive synthesis as a prerequisite and a corequisite for reading comprehension in terms of understanding information stated explicitly and implied by the writer. McLeod (1978), Leong (1974), Kirby and Das (1977), and Cummins and Das (1977) have all studied reading in relation to the information integration model. In terms of Gray's "aspects" of mature and critical reading, McLeod's study is directly related. He tested grade four students who were classified as very proficient and less proficient readers in order to determine whether inference generation is related to simultaneous and successive cognitive synthesis. Based on his findings, he concluded generally that cognitive synthesis was significantly related to aspects of inferencing, and specifically that simultaneous synthesis was positively related to forward looking inferences. He also found a negative relationship between successive synthesis and backward looking inferences. In addition to confirming aspects of the two different coding processes, these findings also introduce the notion of efficient and inefficient strategies in information processing. Of even greater interest was the suggestion by McLeod for an exploration into the psychological functioning of the planning and decision making component of the information-integration model. His suggestion was that research into the formulation of intentions and programs and the subsequent decision making process could provide greater insight into the nature of inferencing in reading, in terms of which information the reader would use for an inference as well as when to stop inferencing. He concludes that the frontal area of the brain should be investigated "so that further insights may be provided into the reading process" (McLeod, 1978, p. 250). The current research was initiated in an attempt to provide these insights.

Smith (1971) and Goodman (1976) argue that the fluent reading process is one which requires the reader to actively synthesize information to reduce uncertainty. The reader can sample from various cue sources (graphophonemic, syntactic and semantic). The skilled reader makes effective use of the redundant aspects of these cues. Indeed, by so doing he interacts with the text in such a way that many of the "underlying processes" become almost automatic. Discussing a notion similar to this, Hall (1911) felt true reading occurred:

> when the act has become so secondarily automatic that it can be forgotten and attention can be given solely to subject matter. Its assimilation is true reading and all else is only the whir of the machinery and not the work it does. (Hall, 1911, p. 445)

It is the automaticity of functioning alluded to above which was one of the fundamental notions used by Huey (1908) in describing the processes which characterized people at different stages of reading ability.

According to Brown (1970) the skilled reader is able to scan text with a considerable amount of syntactic and semantic expectancy. He develops the idea that reading is basically a reconstructive process based on the underlying meaning of the sentence. The reader actively reconstructs by reorganizing the information sampled into meaningful units at the word, phrase, proposition, and discourse level. These meaningful units are the result of a synthesizing process which allows the reader to make sense of what is read. By such synthesizing or "chunking" the reader can offset the "bottleneck" imposed by short-term memory. Miller (1956) found that the capacity of short-term memory is seven units plus or minus two. The more effectively the reader can chunk information into "meaningful wholes" (as opposed to serial processing of individual letters), the more effective the process of reorganizing and reconstructing is likely to be.

Neisser (1967) addresses the notion of levels of synthesis in processing under the rubric of parallel processing. He goes on to describe two types of attention; preattention and focal attention. In the preattentive stage the reader makes use of his tacit knowledge of letter sequences in order to segregate "units" in a global, holistic, and nondetailed way. In the process of focal attention the chunks or groups of words are interrelated, synthesized, or reconstructed in the mind of the reader. This synthesis is not unlike the "analysis by synthesis" position of Halle and Stevens (1959) and is not incompatible with Luria's (1966) theory of simultaneous and successive synthesis. Neisser speculates that the integrative synthesis process is a type of silent calculation where the reader forms hypotheses about the original message. Rapid reading becomes "a continuous silent stream of thoughts" (Neisser, 1967, p. 136) based on these hypotheses and culminates in decisions or syntheses that permit the apprehension of meaning. It is possible that these silent streams of thought are akin to the role of subvocalization as described by Edfelt (1960), Hardyck and Petronovich (1970), and McGuigan and Rodier (1968), or inner speech as articulated by Huey (1968), James (1890), and Vygotsky (1962), and may be essential when dealing with the synthesizing aspect of comprehending text.

Stauffer (1977) equates the fluent reading act with higher forms of thinking. In so doing he outlines the importance of decision making when he states:

> To make decisions and deal with alternatives requires mental discipline. In essence the dimensions of creative and versatile reading are: ability to actualize concepts and intentions, ability to sift information, and determine its relevance to one's anticipation as well as to actively follow an author's intentions and fidelity; ability to deal with constraints and invariants in terms of goals being sought, ability to maintain in dynamic equilibrium the personal

> components of convictions and inclination, ability to accept responsibilities involving choice and volition among different options and exercised on the basis of congruences; and ability to internalize the knowledge gained by and used in other solutions. (Stauffer, 1977, p. 52)

Adler (1940) expressed a similar view when he noted:

> The art of reading. . . includes all the same skills that are involved in the art of discovery: keenness of observation, readily available memory, range of imagination, and of course, a reason trained in analysis and reflection. . . . To whatever extent it is true that reading is learning it is also true that reading is thinking. (Adler, 1940, p 43)

Thorndike equated reading with reasoning and explained that it was akin to problem solving--"all under the right mental set or purpose or demand" (Thorndike, 1917, p. 329), while Dewey (1933) felt that reflective thinking involved gazing into the future to develop a prognosis or forecast. This is not unlike the thinking utilized in the hypothesis testing act as outlined by Khodzhava (1957):

> These hypotheses create a certain orientation or "apperception" and make the subsequent reading, an active process in which the search for the desired meaning and the discernment of agreements or disagreements with expected meaning, begin to assume an almost exclusive role. (Khodzhava, cited in Luria, 1966b, p. 412)

Finally, Stauffer (1976) states the case of the reader as evaluative decision maker in much more global terms when he writes:

> Democracy and ignorance do not go together. A citizen must not only be able to read but also to weigh and judge what he reads. He must read widely, selectively, and frequently. In turn his decision about the value of what he reads must be based on his examined experiences and verifiable knowledge. To do this his mind rather than his memory must be trained. He must learn to raise his own questions, to seek answers

> diligently and boldly, to analyze and to act. The only fear a scholar should have is the fear that he must face the consequences of his own decisions. (Stauffer, 1976, p. 8)

It is the contention of the writer, that decision making ability is crucial to the fluent reading process on a number of levels. First of all, it is necessary to decide what one wishes to read. It was Bacon (1625) who suggested that:

> Read . . . but to weigh and consider. Some books are to be tasted, others to be swallowed, and some few to be chewed and digested. (Bacon, 1625/1928, p. 19)

This is not a skill easily acquired. Harris (1974) feels that only the well-fed mind can decide wisely what should be read. Speculating thus, he concludes:

> Feeding the mind may be our most neglected area of public health, in its broadest social aspect. (Harris, cited in Stauffer, 1976, p. 7)

Secondly, having selected some literary material the fluent reader must decide on a purpose which will act as a cognitive map to guide his reading. Theorists like Stauffer (1976) feel that the key here is the reader's ability to raise questions:

> Self-declared purposes make the reader accessory to the content rather than subservient. Above all, self-declared purposes cause the mind to leap forward to possible solutions, by establishing hypotheses to guide the decision making. (Stauffer, 1976, p. 8)

Finally, decision making is crucial in understanding how the fluent reader achieves the higher levels of "mature" fluent reading as a task-specific thinking process. As Stauffer (1976) has noted:

> To reason is to do productive thinking and refers to the solution of problems by logical operations and the making of judgments. The making of judgments is a process with definite antecedents and consequences. The judgments must be relevant, not only to the purposes declared but also to its validity of the material being read. Because the making of judgments is an evaluative process, the reader is required to determine the value of the facts and their consequences. (Stauffer, 1976, p. 8)

The fluent reader must be able to sample, predict, and form hypotheses based on efficient decision making strategies. While he must be willing to take risks, or else be bound to the serially presented text, he must not be overly impulsive. In an attempt to efficiently reorganize and restructure the information sampled, he must have a notion of what is required in the task as well as a "plan" on which to operate. He must be able to analyze and synthesize information, segregate parts from the whole, and to simultaneously synthesize the parts into the whole.

Planning, intention, and decision making are of paramount importance since they provide the individual as reader with what can be construed as the single most important variable in fluent reading--flexibility. This ability to "shift gears", to determine a purpose and act upon it in a self-directed manner represents the "knowing when" of a process that has traditionally been studied from the point of view of "knowing how" or "knowing if". Fluent reading has been described as an active involvement of the reader with the text. However, the social and communicative aspects are always limited by the solitary component of the reader interacting with his own "intentions". When all has been said and done, it may be the self-direction, the internal control and the intentions of the reader that determine the flexibility that is needed in fluent reading.

Another perplexing question requiring clarification is whether or not more efficient processing strategies can be taught to those individuals who have difficulty breaking learning sets, who have problems restructuring and re-organizing material, who decide impulsively and who sample salient rather than relevant cues. Although there have been some interesting studies conducted in this area (Dickie, 1970; Grippin, 1973; Nelson, 1973) research is not definitive at this point. Additional studies are required in task specific reading situations.

Equally important, studies in addition to the present one are needed which investigate the planning and decision making components of the cognitive synthesis model in relation to the orientation to reading outlined in Figure 2.1. By so doing, a valuable mediator variable in the fluent reading process may be uncovered.

Fluent reading utilizes a host of complex thought processes. By investigating the intricacies of this "most remarkable specific performance" we come closer to attaining a clearer view of the inner working of the human organism. The role of decision making in this process is unparalleled for as Dubos (1968) has stated, "The ability to choose among ideas and possible courses of action may be the most important of all human attributes" (Dubos, 1968, p. 128).

Finally, from a sociological perspective, research is needed which attempts to isolate those factors which are antecedent to the development of the individual as a fluent reader. As such, socialization practices, social stratification factors, biological factors, and ecological and environmental variables should be explored as precursors to the fluent reading process. By so doing, an important question may be answered with multi-faceted implications for future research in the field of reading and literacy.

Information Integration and Reading

There is a growing body of research linking the information integration model to reading ability. In a review of research Cummins and Das (1977) have already pointed out this relationship. More recently Robinson (1983) has reviewed the literature with similar results.

Studies by Kirby and Das (1977) and Ryckman (1981) have shown a relationship between simultaneous and successive processing and measures of school achievement. In the latter case, Ryckman used different measures of simultaneous and successive processing with the same results as the 1977 study. Other researchers, Randhawa and Hunt (1979) and Kirby (1980) have specifically linked simultaneous and successive processing skills and reading achievement.

In research examining coding processes and reading, Kaufman and Kaufman (1979) and Krywaniuk and Das (1976) have indicated a link between successive processing and decoding skill. On the other hand, Kirby (1980) found evidence that suggested simultaneous processing is useful in integrating information on a higher semantic level. This would seem to corroborate the findings of McLeod (1978) indicating a link between simultaneous processing and forward looking inferences.

Work with learning disabled and normal readers has shown that disabled readers seem to perform particularly badly on successive processing tasks. Indeed, in some factor analytic studies (Leong, 1976, 1980; Ryckman, 1981) successive marker tests administered to learning disabled children, did not load on a successive factor.

Research, at present, is divided as to the reasons for this phenomenon. Some researchers, Krywaniuk and Das (1976) and Kaufman and Kaufman (1979) feel that subjects spontaneously choose a strategy which may be inappropriate. Others (Biemiller, 1970; Cohen, 1975; Gibson, 1971; Lovett, 1979; and Weber, 1970) have produced research which suggests learning disabled children use less efficient strategies because of necessity. The latter approach relates simultaneous and successive processing proficiency to reading in a developmental context. According to these researchers, the earliest stage of reading in this developmental paradigm requires a form of global processing as it relates to language context. Stage 2, essentially a decoding stage, requires proficiency in successive processing and stage three (fluent reading) requires a successful integration of the two. Some researchers (Beimiller, 1970; Cohen, 1975) have suggested that poorer readers may not be able to break out of the first developmental stage.

Interestingly enough, the explanation outlined above does not explain the results of studies conducted by Krywaniuk and Das (1976) and Kaufman and Kaufman (1979) which showed that training poor readers in successive processing strategies aided in decoding skills. This finding, that training in processing strategies can improve specific reading skills, not only offers hope in terms of remediation but allows one to look at the individual as reader with promise in terms of teaching appropriate processing strategies to the inefficient processor.

Analytical Introspection/Retrospection and Protocol Analysis

In an attempt to describe what happens when a specific reader interacts with a specific text at a specific time, it is necessary to have the reader engage in the reading act. The acquisition of meaning is the goal of this process. Although this is the goal, measurement of comprehension can be elusive. The reason lies in the fact that it is a covert personal process, private to the individual who is interacting with the text.

Frederickson (1975) in a cogent description of comprehension notes:

> Understanding may be regarded as a process whereby a listener or reader attempts to infer the knowledge structure of a speaker or writer by using the available linguistic message, contextual knowledge, and his own knowledge store as 'data structures' from which the inference is made. (p. 371)

The problem for the investigator, then, becomes one of verification. In an attempt to measure the comprehension process, a number of researchers have designed systems to categorize protocol material collected from readers. The assumption is made that unaided recall data produced by subjects after reading silently, (retrospection) or while thinking aloud during reading (introspection) will be useful as an indicator of whether or not comprehension has taken place.

Bartlett (1932) observed there were cultural schemas underlying story recall although he did not evolve a classification procedure for analyzing the textual or recall data. The 1970's produced a number of researchers who designed paradigms for this purpose. Frederickson (1975) devised a system which he proposed resembled the structure of memory. Mandler and Johnson (1977) refined the notion of story schemas and found, by analyzing textual and recall data, that readers use story schemas to aid in acquiring meaning and recalling material.

Kintsch (1978) created an hierarchical classification system which compared recall material to material in the text. He described the three levels of propositions generated as (1) reproduction (verbatim recall), (2) transformation (reordering of propositions, explaining, lexical substitution, and changing perspective), and (3) reconstruction (generating inferences based on background knowledge or filling in the gaps when textual information was not readily available).

Tierney, Bridge and Cera (1979) evolved a system which they suggest highlights the abstractive and constructive processes which go on when the reader recalls textual material. Abstractive processes involve selecting relevant ideas from the text. Constructive processes involve relating the information gleaned to background knowledge.

Drum and Lantaff (1977a, 1977b) have also evolved a system of protocol analysis. Furniss (1978) was among the first to apply the categories to different types of textual materials. Their system is particularly relevant to the current research for a number of reasons. (1) It has incorporated the findings of a considerable amount of previous research; (2) it focuses not only on the recall 'per se' and the text base but on the production output of the reader as well; (3) it classifies responses into a number of specific categories which results in the acquisition of quantitative as well as qualitative data; (4) Fagan (1985) has modified and refined the categories through recent research at the University of Alberta. Since the latter was a readily available colleague for consultative purposes, the Drum & Lantaff categories with modifications, were used in the present research.

Summary

Insights into the area of cognition suggest that there is an executive functioning or planning component which guides and regulates behavior of the individual. Research in reading suggests that intention and purpose as well as prediction, verification and hypothsis testing are critical thinking skills related to the fluent reading act. One way of assessing these skills is through standardized tests. Many such tests measure the product rather than the process. A second method is to have subjects read and using the technique of analytical introspection/retrospection obtain protocols of subject responses.

Research in reading comprehension has produced a number of ways to evaluate protocol output of readers so as to examine underlying cognitive processing strategies. It was with this purpose in mind that researcher designed reading tasks were administered to subjects chosen according to their cognitive planning abilities. It was felt that the protocols of these subjects, when analyzed, might provide insights into their cognitive planning abilities. The instruments utilized in this process and the analytical methods employed will be explained more fully in Chapter 3.

CHAPTER 3

INVESTIGATIVE TECHNIQUES AND RESEARCH PROCEDURES

This chapter describes the design and research methods employed in the study. The selection and description of the sample, the research instruments used, and the techniques employed in data collection are presented. The methods of data treatment are explained.

Design

The central focus of the study was to explore the relationship between cognitive planning and the reading behaviour of young adults who were selected according to their cognitive planning abilities. To achieve this purpose the research was carried out in two phases.

The first phase involved administering selected tests of information integration, intelligence, cognitive style, and standardized reading to all grade IX students in a rural junior high school.

Four years later, in phase II of the research, students with disparate profiles of scores on the visual search test, a measure of planning, were selected for further in-depth study which included administering to them specific reading tasks. All reading tasks and passages used in phase II were pilot tested first to determine their suitability for use. Following the pilot testing the researcher-designed tasks were administered to 20 students. These included 13 of the 15 proficient planners and seven of the less proficient planners. The ten remaining subjects either could not be located due to the passage of time or they refused to participate in the phase II research. Those subjects who did participate, silently read the material selected during pilot testing in task specific reading situations.

Design of Phase I

Sample

The subjects in the study included all grade IX students enrolled at a consolidated junior high school in rural Nova Scotia. The students came from a number of small communities and were bused to and from school on a daily basis. In the spring of 1980, when the research was conducted, there were 148 students enrolled in grade IX. This number included 70 girls and 78 boys. Grade IX subjects were selected for a number of reasons.

First these students had been in the educational system for some time and were therefore aware of what was expected of them in a testing situation. Secondly, grade IX is often an educational decision making juncture where students are required to make decisions regarding the academic route they will pursue. Many students at this level appear to be poorly equipped to make these important choices. Because this is such a critical time in the academic and social life of the individual, the researcher wanted to focus attention on this group.

Another reason for selecting subjects in grade IX was the writer's desire to have a group of students to look at "a few years down the road." If, as suggested in point two, grade IX represents an important educational milestone, it was felt that the wealth of information available on these subjects might lead to the generation of some inferences or the formulation of some hypotheses related to success or failure in the school system, and their subsequent career choices.

Finally studies by Latham (1973) and McLeod (1978) had examined cognitive synthesis and the reading behaviour of college and grade four readers respectively. Hence, it seemed that it would be appropriate to examine junior high school readers and compare the findings with the aforementioned studies.

Application to gain admission for testing was made to the Chief Educational Officer of the Municipal District School Board in March of 1980. With permission granted, the principal of the school was contacted and testing was carried out during May and June of 1980.

Phase I--Instrumentation and Data Collection

The instruments used in assessing the 148 students who participated in Phase I of the research included the following:

I. Information Integration
  1. Planning
    (a) Visual Search Test (VST)
    (b) Trail Making Test (TMT)
  2. Simultaneous Processing
    (a) Memory for Designs (MFD)
    (b) Figure Copying (FC)
  3. Successive Processing
    (a) Digit Span (DS)
    (b) Auditory Serial Recall (ASR)
II. Cognitive Style
  1. Group Embedded Figures Test (GEFT)
III. IQ
  1. Ravens Progressive Matrices (RPM)
IV. Standardized Reading
  1. Cooperative Reading Test (CRT)

The instruments used to assess the planning and coding abilities of the subjects were taken from the Cognitive Synthesis Battery (Das, Kirby, & Jarman, 1979). These instruments have been used extensively by Das and his fellow researchers and are well documented in the literature much of which was reviewed in Chapter 2.

I. Information Integration

1. Planning

(a) Visual Search Test

This is an individualized test which was developed by Poppelreuter in 1917 and was used by Teuber, Battersby and Bender (1949) for the identification of search defects after cerebral lesion. Teuber (1964) found that frontal lesion resulted in a reduction of speed and efficiency of search. This reduction was considerably more pronounced than that resulting from lesions in the posterior cortex. As a result, visual search was considered to be a measure of planning. In the present study, 12 transparencies containing a series of geometric shapes (pictures) and letters were used to assess the visual planning abilities of the subjects.

In the centre of each transparency was a target which was either a picture or a number. Four of the transparencies contained picture standards in fields of pictures; four contained number standards in fields of pictures and four contained number standards in fields of letters. Two trial transparencies were administered to each subject. One contained a number standard in a field of letters, the other a picture standard in a field of letters. When the subject understood how the apparatus worked the actual testing began. The 12 transparencies were randomized and presented to all subjects. In each case, the subject depressed a button on the apparatus which turned on a light allowing the subject to see the transparency. This procedure also activated a timer which measured his search time in seconds and 100ths of a second. When the subject located the target in the field, he removed his hand from the button which activated the light and proceeded to depress the screen on the apparatus where the target appeared in the field. This procedure activated a second device which measured reaction time in 100ths of a second. Search and reaction times were calculated for all 12 trials and an average search and reaction time was recorded.

(b) Trail Making Test

This individualized test was originally part of the Army Individual Test of General Mental Ability (1944) and was adopted by Armitage (1946), Reitan (1955) and Spreen and Geddes (1969) as a neurological screening test to assess brain damage. Armitage suggested this test measured planning, the ability to see a double relationship, and the ability to shift from one stimulus sequence to another. The test has two forms--an intermediate level (ages five - 14) and an adult level. The adult form was administered in the research. The trail making test is subdivided into parts A and B. Part A requires the subject to connect in the correct order encircled numbers which are randomly scattered over the page. Part B requires the subject to draw lines alternatively between letters and numbers in the correct increasing sequence (e.g., 1a, 2b, 3c, 4d). The procedure outlined by Armitage (1946) was followed with the exception that the test was administered individually. The total time required for completion of the test was recorded.

2. Simultaneous Processing

(a) Figure Copying

This test, which was administered in a group setting, was formerly used at the Gesell Institute as a measure of developmental readiness. Designed by Ilg and Ames (1964) it requires subjects to reproduce 10 geometric items. The test has been especially adapted for the Cognitive Synthesis Battery by adding some additional figures to alleviate the ceiling effect when using the test with older groups of students or adults. There is no time limit and subjects are permitted to look at the standard figure as long as they wish.

Standard figures appeared on specially prepared booklets below which there was ample room provided for reproducing the figure. A total of 15 figures appeared in each booklet, the first three of which were for practice only and were not part of the actual scoring. Drawings were scored 0, 1, 2, 3 or 4 according to criteria which emphasizes proportion and the maintenance of geometric relations rather than exact reproduction. Total scores for each subject on the 12 test figures were recorded.

(b) Memory for Designs

This instrument developed by Graham and Kendall (1960) consists of 15 figures which are projected onto a screen for a period of five seconds using an overhead projector. Subjects were tested in a group setting and each participant was given a booklet with 15 blank pages on which he was to reproduce from memory the figures presented. A research assistant aided in making sure subjects did not start drawing designs until after the presentation and checked to make sure all participants had finished drawing before the next figure was displayed. Designs are scored 0, 1, 2 or 3; three being the poorest score according to an evaluation system which emphasizes the relation of proportions, rather than the exact production of details. The scoring system is explained in detail in the manual which accompanies the test.

3. Successive Processing

(a) Digit Span

This test is taken from the Wechsler Intelligence Scale for children (1974) and was administered in a group setting. Subjects were read a series of digits of increasing lengths and were required to recall them by writing them on sheets of paper provided. All digits were in sets--two sets of three, two sets of four and so on up to nine. Consequently, the highest score a subject can achieve is nine. The digits were presented orally at a rate of one per second. Students were tested in a group setting. They were asked to sit quietly with their pencils on the desk until the series of digits was presented. They then picked up their pencils and wrote the digits on their answer sheets. The subject's score is based on the longest string of digits correctly reproduced.

(b) Auditory Serial Recall

This test, revised from its original format by Ashman (1978) was administered in a group setting and consists of 88 words arranged in groups of four. Group one consists of four strings of four words each. Group two consists of four groups of five words each. Group three consists of four groups of six words each and group four consists of four groups of seven words each. In each four group series, scores were only given for words in the correct serial order. The maximum score was 88. The words were presented at the rate of one per second while subjects sat listening. After the word string was presented subjects wrote the words on papers provided. A research assistant aided in making sure no one was writing during presentation of the words and that everyone had finished prior to presentation of the next set.

II. Cognitive Style

1. Group Embedded Figures Test

This test was administered in a group setting and is adapted from the Embedded Figures Test (Witkin, 1950). According to Witkin (1971), the GEFT is a measure of the cognitive style variable field dependence/independence. Das (1979) speculates that the GEFT and test of simultaneous processing are related. Additional evidence on this relationship is indicated by Heemsbergen (1980). The test is divided into three sections. Section I contains seven figures; section II, nine figures; and section III, nine figures. To receive credit for an item the subject must find a simple figure within a complex design and trace it with a pencil. Simple figures do not appear on the same page of the test booklet as the complex figures in which they are embedded. Subjects are permitted to look at the simple figures as many times as they desire. One point is given for each figure correctly traced in sections II and III. Section I is for practice only.

Subjects have two minutes to complete section I, five minutes for section II and five minutes for section III.

No points are awarded for partial attempts or in cases where more than the required number of lines is drawn on a figure. Scores can range from 0 to 18.

III. Intelligence

1. Ravens Standard Progressive Matrices

This group administered test (Raven, 1936) is a widely used measure of intellectual reasoning requiring few verbal directions. The test consists of 60 problems divided into five sets of 12 problems each. In each of the 60 designs a part has been removed and the subject must choose the missing insert from one of six possible alternatives, in sets A and B, and from one of eight possible alternatives in sets C, D and E. In each set the first problem is quite simple but problems become progressively more difficult. Students were given copies of the 60 problems and an answer sheet on which they circled the solution of their choice for each problem. The subjects' score is based on the number of inserts correctly identified in 60 problems.

IV. Standardized Reading

The Cooperative Reading Test

This standardized group administered test is part of a battery of tests collectively known as the Cooperative English Tests. These tests were originally developed in the nineteen forties but the version used in the present research was developed in the nineteen sixties by Educational Testing Service. The test has a number of forms. Since form 2A is recommended for use with grades 9, 10, 11, 12, it was the one chosen.

The tests consist of two sections. Section I contains 60 vocabulary items. A word is presented and the subject must select the correct meaning from one of four choices. The time limit on this section is 15 minutes. Section II consists of nine passages. Students have 25 minutes to read the nine selections and answer the comprehension questions after them. The directions accompanying the test indicate to students that they are not necessarily expected to finish this section. However, they are encouraged to work as rapidly as possible without making careless mistakes.

The test produces three sets of scores. The first is a vocabulary score which is the students' performance on the 60 vocabulary items. The second is a speed of comprehension score based on the total number of correct responses on 60 comprehension questions. The third is a level or power of comprehension score which is the result of the subjects' performance on the first 30 comprehension questions.

The total reading score is achieved by averaging converted Vocabulary and Speed of Comprehension scores, since the latter encompasses all 60 comprehension items.

Converted scores, as opposed to raw scores, are normally used in interpretation because converted scores have been statistically adjusted to allow for comparisons among different forms and levels of the tests. Since such comparisons were not being made in the present research, raw scores representing vocabulary, speed of comprehension and level of comprehension were used as markers of abilities in these critical areas of reading. The Cooperative Reading Test was chosen for three reasons. First it required students to read material similar in nature to that contained in the three types of passages selected for use in the qualitative phase of the study. Secondly, prior knowledge gleaned from the content areas in school is of little value when doing the Cooperative Reading Test. As a result, it gives a more accurate reflection of what the reader has understood. Thirdly, the comprehension questions on the test are set up in such a way as to tap a number of different levels of comprehension. At times the subject may have to recall a fact. On other questions he might be expected to evaluate or interpret what he has read.

Treatment of Data

Phase I

In analyzing this data, quantitative measures were used. A variety of statistical computer programs at the University of Alberta's Division of Educational Research were utilized for this purpose. Included in the analyses were the following measures:

1. Principal components analysis with varimax rotation was used to determine the factor loadings on all measures used in the study. Factor analytical procedures have been used extensively in previous Information Integration Research (Das, Kirby, & Jarman, 1975, 1979).

Two factor analyses were performed. The first contained information collected on all 148 subjects in the phase I research. The second included information collected from 140 subjects only as there were eight subjects on whom there were incomplete data files.

2. Three way analysis of variance was employed using all subjects' scores to test for main effects and interactions due to:

(a) Planning, successive processing, simultaneous processing and vocabulary

(b) Planning, successive processing, simultaneous processing and speed of comprehension

(c) Planning, successive processing, simultaneous processing and level of comprehension

3. The data collected from the Information Integration Tasks were used to divide the 140 subjects, on whom there were complete data files, into eight information integration groups.

1. HHH - High Planning, High Successive, High Simultaneous
2. HLL - High Planning, Low Successive, Low Simultaneous
3. HLH - High Planning, Low Successive, High Simultaneous
4. HHL - High Planning, High Successive, Low Simultaneous
5. LLH - Low Planning, Low Successive, High Simultaneous
6. LHH - Low Planning, High Successive, High Simultaneous
7. LHL - Low Planning, High Successive, Low Simultaneous
8. LLL - Low Planning, Low Successive, Low Simultaneous

A system based on percentages of all subjects' scores above the median (except for Visual Search where low scores--below the median--represent fast performance) was designed to examine the relationships between the eight information integration groups and reading as defined by vocabulary, speed of comprehension and level of comprehension scores.

First a median split was performed on the raw score data. Next, using a system of assigned scores all subjects were placed in one of the eight information integration group cells. The raw scores used in the median split were based on the subjects' performance on a planning test (Visual Search latency), a successive test (Auditory Serial Recall) and a simultaneous test (Figure Copying).

After placing the subjects into cells, using the procedure outlined above, the median split was used to determine the number of subjects above and below the median on the Vocabulary, Speed of Comprehension, and Level of Comprehension subtests of the Cooperative Reading Test.

By using this procedure it was then possible to determine the number of subjects above and below the median on all three reading measures in each of the eight information integration groups. Percentages were then computed to more clearly show the relationships between Information Integration and the three measures of reading ability as determined by Cooperative Reading Test performance.

4. Pearson product moment correlations were calculated to determine the significance of the relationships between variables.

5. Subjects were computer sorted according to performance on the visual search task, a measure of planning. The 15 most proficient planners and the 15 least proficient planners were identified for further testing and constituted the sample for the phase II research. The results of these analyses are reported in Chapter 4.

This concluded the phase I testing conducted in 1980. Following phase I testing, a pilot study was carried out to select passages and design reading tasks to be used in phase II of the research. The pilot testing was conducted between 1983-1984 and resulted in the selection of nine passages and three types of reading tasks which were used with selected students in a post hoc testing situation. It is the phase II research conducted in 1983-1984 which will be discussed next.

Design of Phase II

Sample

The subjects who participated in phase II of the research were selected on the basis of their planning abilities as defined by their visual search times from phase I of the study. Using a computer sorting procedure, the 15 subjects with the fastest search times and the 15 with slowest search times were identified. Since four years had elapsed, many of these subjects were now out of the school system and there was some difficulty in locating them. Thirteen of the top planners and seven of the bottom planners were eventually contacted. Table 3.1 identifies these subjects according to number, sex, search time, and post hoc testing participation status.

Those subjects who agreed to participate were administered researcher designed reading tasks. The technique of analytical introspection/retrospection was used

TABLE 3.1

15 Most Proficient and 15 Least Proficient Planners
N = 30

Number	Sex	Search Time in Seconds and 100ths of a Second		Post hoc Testing Status	
062	F	0.44	Located	Accepted	
090	M	0.53	Couldn't Be Located		
114	M	0.57	Couldn't Be Located		
024	M	0.69	Located	Accepted	
016	M	0.70	Located	Accepted	Tested N = 13
116	M	0.72	Located	Accepted	
068	M	0.76	Located	Accepted	
076	M	0.76	Located	Accepted	
128	F	0.79	Located	Accepted	
023	F	0.81	Located	Accepted	
115	F	0.81	Located	Accepted	
082	F	0.83	Located	Accepted	
022	F	0.84	Located	Accepted	
118	M	0.84	Located	Accepted	
048	M	0.89	Located	Accepted	
051	F	6:52	Couldn't Be Located		
032	M	5:05	Located	Accepted	
110	F	4:97	Located	Accepted	Tested N = 7
074	F	3:99	Located	Refused	
099	F	3:80	Located	Accepted	
111	F	3:76	Located	Accepted	
064	M	3:27	Located	Accepted	
063	F	3:04	Located	Refused	
061	M	3:00	Located	Refused	
096	M	2:98	No Personal Comm.	In Armed Forces	
122	F	2:94	Located	Refused	
060	F	2:92	Located	Accepted	
088	M	2:86	Located	Accepted	
089	M	2:75	Located After Testing		
011	F	2:70	Couldn't Be Located		

to acquire information which it was hoped might pinpoint underlying cognitive planning and coding processes. All responses were audio tape recorded and then typed for later qualitative analysis. Subjects were also retested using the simultaneous and successive instruments used in phase I of the study.

Phase II Instrumentation and Data Collection

The instruments used in assessing the 20 subjects who participated in phase II of the research included the following.

I. Information Integration.

1. Successive synthesis (Auditory Serial Recall, Digit Span)
2. Simultaneous synthesis (Figure Copying, Memory for Designs)

These marker tests, previously described under phase I instruments were readministered to see if the measures were stable over time.

II. Researcher Designed Reading Tasks

Three types of reading tasks were designed by the researcher in an attempt to tap the cognitive processes underlying the fluent reading act. It was hoped that analysis of the protocols collected would reveal if planning strategies were being utilized by the readers. The directions for administering these tasks are presented in Appendix A.

1. Silent Reading Uninterrupted Recall (SRUR). The subject was given a complete passage and asked to read it silently in its entirety. After reading, the subject was asked to recall what he had just read. All responses were audio tape recorded and typed for later analysis.

2. Silent Reading Interrupted Recall (SRIR). The subject was given a passage in predetermined chunks or pieces. Using an approach originated by Stauffer (1976) each participant was first shown only the title. He was asked to speculate on the passage content based only on this piece of minimal information. After responding he was given the next section to read silently and after finishing was asked to recall what had just been read. Before proceeding to the next section, the subject was asked to speculate on what he felt would happen next. All responses were audio tape recorded and typed for later analysis.

3. Silent Reading Sentence Retrospection (SRSR). The subject was asked to read the passage sentence by sentence silently. After each sentence he was asked to think aloud about what he had read. Although this task was an obvious distortion of the reading process, as was task 2, it was hoped that some valuable insights related to processing and coding strategies used in reading might be acquired in this way.

III - The Pilot Test

The pilot test was carried out with two purposes in mind. The first was to determine if the researcher designed tasks would generate a diversity of responses from phase II subjects. The second was to see if the protocol classification system to be used was appropriate for categorizing the responses of subjects in phase II of the study.

Initially 21 passages were selected for possible use in assessing the reading abilities of the subjects statistically selected from phase I of the research. The passages chosen were of three distinct types: Narration (N), Exposition (E) and Persuasion (P). These categories were selected because the researcher wanted to ascertain if planning, coding and processing abilities were related to passage format characteristics and because students are required to read passages having these format characteristics in the content areas of the school curriculum.

A. Type I--Narration (N). Passages in this category told a story. They contained the elements of plot, character and setting. Those selected in this category included The Family Which Dwelt Apart, The Unpopular Passenger, The Free Trappers Winter Diet, After Twenty Years, Impulse, The Catbird Seat, Dip In the Pool and The Homesick Buick. More detailed information on authors and publishers is located in Appendix B.

B. Type II--Exposition (E). Passages in this category, as the name suggests, presented information in a format similar to that found in many textbooks. The passage content included names, facts, figures, details and contrasts and comparisons. The one notable exception was a passage entitled The Desensitization of Twentieth Century Man. To the reader, it may appear that this selection should be included as a Type III (P) passage. It appears as a Type II selection because it begins like a Type I (N) and concludes like a Type III (P) passage. In certain places it contains elements of a Type II (E) work.

The researcher was interested in seeing how subjects might react to this change of information presentation. For the reasons outlined above it was included in the Type II (E) category. Others selected in this category were Crocodilians, Flies Everywhere, Poisonous and Dangerous Fishes, Chimpanzees and Communication, Ants and Their Social System and Think Along with the Astronomers.

C. Type III--Persuasion (P). Passages in this category presented a central thesis around which the author constructed an argument. The argument was developed through a number of points related to the central thesis. Type III passages were written to convince and persuade the reader. Those falling into this category included Don't Let Stereotypes Warp Your Judgment, A Man's Opinion, Loosen Up, Exploring the Unknown, Freedom to Use the Mind, Six Ways to Tell Right From Wrong and Reason Tells Us This is Wrong.

To determine whether or not the passages chosen were appropriate to use with the selected Phase I subjects, cloze tests were prepared for all 21 selections. In each case, the first and last sentences in the test passages were left in tact and thereafter every fifth word was omitted. The passages, which contained 50 blanks, were administered to 53 vocational students. The trades represented in the cloze readability group included Shipwright, Cosmetology and Stenography. Nine males and 44 females participated. Vocational school students were chosen for several reasons.

First, contact had been made at this point, with a number of the statistically selected phase I subjects and it was known that some of these individuals had left school as early as grade IX. Because the vocational students in the cloze pilot testing covered a range of grade levels (8-12) it was felt that they might represent a group similar to those participating in the phase II research.

Secondly, many of the vocational students had some combination of academic and general courses making them similar in many ways to phase II subjects.

Thirdly, the vocational students were similar in age to those participating in phase II of the research.

Fourthly, the vocational students represented a group who in background, upbringing and geographical location were similar in many ways to phase II subjects.

Finally and equally important, the vocational students represented a population easily accessible to the researcher.

It must be noted here that due to the amount of regular school time involved in administering 21 cloze passages to 53 individuals, there were many occasions when sample size was reduced due to scheduling of students and course constraints. Every effort was made to re-test students who were unavailable during the scheduled testing periods, but an early release program within the school contributed to frustrating these efforts.

Table 3.2 summarizes the cloze test performance of these students on the 21 passages by type, title, level and sample size. Based on these results, particularly as they related to the number of subjects in the frustration level, a Fry Readability rating was also applied to each passage. Three 100 word passages were selected from each of the 21 articles and the average number of syllables and sentences per 100 words was plotted on the Fry graph. Table 3.2 also shows the Fry Readability level for the 21 passages. The discrepancy between cloze test performance and Fry Readability Level can clearly be seen with this group of subjects. Because of this discrepancy, the passages which placed the largest number of students per sample in the independent range were chosen. This seemed to be a reasonable decision rule since the passages represented a range of grade levels from 7-10, as did the phase II participants,

TABLE 3.2

Close Performance and Fry Readability Level
of Pilot tested Passages According to Type,
and Passage Title

Passage No.	Type	Passage Title	Size of Group	Cloze Level A Independent 58+ B Instructional 44-57 C Frustration -44 A	B	C	Fry Readability By Grade Level
1	N	The Family Which Dwelt Apart	48	8	26	14	9
2	N	The Free Trappers Winter Diet	46	0	2	44	9
3	N	The Catbird Seat	45	29	16	0	7
4	N	The Homesick Buick	40	15	18	7	7
5	N	After Twenty Years	27	2	22	3	7
6	N	Impulse	48	5	29	14	7
7	N	Dip in the Pool	11	0	6	5	8
8	N	The Unpopular Passenger	15	7	7	1	8
9	E	Crocodilians	16	4	11	1	8
10	E	Chimpanzees and Communication	40	0	8	32	9
11	E	Poisonous and Dangerous Fishes	24	0	4	19	11
12	E	Flies Everywhere	13	4	7	2	7
13	E	Ants and Their Social System	41	0	14	27	10
14	E	The Desensitization of Twentieth Century Man	24	20	4	0	9
15	P	Don't Let Stereotypes Warp Your Judgment	42	14	22	6	10
16	P	A Man's Opinion	43	0	13	30	8
17	P	Loosen Up	51	2	18	31	8
18	P	Exploring the Unknown	52	11	31	10	10
19	P	Six Ways to Tell Right from Wrong	23	2	7	14	11
20	P	Reason Tells us This is Wrong	24	7	9	8	8
21	P	Think Along with the Astronomers	46	0	14	32	10

N = Narration
E = Exposition
P = Persuasion

and because it was specifically the planning aspect of reading which was in question here.

From the 21 passages originally examined, nine were selected based on the formula outlined above.

Table 3.3 shows the selection process by passage type, title, cloze test results and readability according to the Fry formula.

The passages chosen were then administered to eight vocational student volunteers in researcher designed reading task situations. These students were in the Marine Electronics and Cosmetology trades. The group included four girls and four boys.

Phase II - Treatment of the Data

I. Information Integration (Quantitative Analysis)

1. Successive Synthesis (Auditory Serial Recall)
2. Simultaneous Synthesis (Figure Copying)

These measures of information integration were scored according to the procedure outlined under Phase I instrumentation. Correlations were computed between the 1980 and 1983/84 test results to examine the stability of the measures over time. The results are reported in Chapter 5.

II. Individualized Reading Tasks (Qualitative Analysis)

The method employed in the qualitative analysis of the protocol material collected by administering the nine passages and three different types of reading tasks is detailed below.

TABLE 3.3

Passages Selected for Phase II Research

	Passage Title	Cloze Level (a) Independent (b) Instructional (c) Frustration a	b	c	Fry Readability	Passage Length In Pages
N	The Catbird Seat	29	16	0	7	15
N	The Homesick Buick	15	18	7	7	21
N	The Unpopular Passenger	7	7	1	8	9
E	Crocodilians	4	11	1	8	9
E	Flies Everywhere	4	11	1	7	3
E	The Desensitization of Twentieth Century Man	20	4	0	9	5
P	Exploring the Unknown	11	31	10	10	11
P	Don't Let Stereotypes Warp Your Judgment	14	22	6	10	3
P	Reason Tells Us This is Wrong	7	9	8	8	4

N = Narration
E = Exposition
P = Persuasion

The audio tapes collected from the pilot testing were transcribed into typed protocols and divided into complete and incomplete 't' units. A complete 't' unit was defined as a principal clause along with any subordinate clauses grammatically related to it (Fagan, 1984). An incomplete 't' unit consisted of words which did not comprise independent clauses but which were necessary to maintain the flow of language (Fagan, 1985).

Each complete and incomplete 't' unit was then classified into one of four categories based on a procedure originally articulated by Drum and Lantaff (1977a, 1977b) but modified and refined by Furniss (1978), Brake (1981), Clarke (1981), Beebe, Fagan, and Malicky (1981), Fagan (1980, 1982), Cronin (1982), and Fagan (1985).

The procedure calls for the division of protocol material into the following categories:

A. Text Exact. This designation includes verbatim partial recall and what Fagan (1985) describes as "vague statements," where the reader uses one term directly from the text.

B. Text Specific. This classification includes pronoun substitution and synonymy of elements.

Fagan (1985) states:

> The operational definition of synonymy is context dependent and may refer to:
>
> a. substitution of one word for another so that semantic and grammatical features are preserved or
>
> b. the sequencing of lexical items from a unit such as the preposing of prepositional phrases or substituting an active for a passive

> c. a paraphrase of the original unit which in the subjective opinion of the scorer has the same conceptual referents and has definite correlates in the text unit. (Fagan, 1985)

C. Text Embedded. This category includes embedded information and noun/pronoun substitution.

D. Text Entailed. This classification covers synthesis which is described as the combining of information from one or more textual units.

E. Text Inferential. This designation involves the generation of inferences to fill in the text.

F. Text Experiential. As might be expected by its title, this category includes additions to the textual information based on background experience and also includes additions to the story line from extraneous sources.

G. Text Erroneous. As its name suggests, this category includes specific errors such as those pertaining to dates and proper names as well as incorrect expansions and additions and incorrect embedding. It also includes non-specific errors such as incorrect and inaccurate knowledge about the world.

Fagan (1985) suggests that depending on the type of research questions being asked, these categories can be collapsed into more global units.

To meet this end, the text exact, text specific, and text embedded designations were collapsed into a text specific category. The text inferential and text experiential categories were subsumed by the rubric text inferential. Finally, the text erroneous specific and non-specific designations were collapsed into a text erroneous category.

Because of the volume of material to be analyzed and because of the nature of the research, a decision was made to go with the more global category designations. To the three outlined above, a fourth was added and labelled Text Speculative. This category included ruminations by the subject regarding such things as the author's style as well as opinions offered by the subject regarding the material read and was added after analyzing the initial protocols indicated it was appropriate.

With four categories selected for the classification of complete and incomplete units the qualitative analysis of the protocols could begin.

The qualitative analysis of the material lent itself to a 3 x 3 x 4 design. More specifically there were three types of tasks (SRUR, SRIR, and SRSR); three types of passages: Narration (N), Exposition (E), and Persuasion (P) and four categories of response type; Text Specific, Text Inferential, Text Erroneous, and Text Speculative. This design is represented graphically in Table 3.4.

The results according to 't' unit production and response category for the SRUR task are reported in Table 3.5.

TABLE 3.4

Design of Qualitative Analysis Paradigm by Task, Passage Type and Response Type

		Response Type			
Task	Passage Type	Text Specific	Text Inferential	Text Erroneous	Text Speculative
SRUR	N				
	E				
	P				
SRIR	N				
	E				
	P				
SRSR	N				
	E				
	P				

TABLE 3.5

The Results of the Silent Reading Uninterrupted Recall Task
for Subjects Participating in the Pilot Test

Subject No.	Passage Type	't' Units	Incomplete 't' Units	Text Specific	Text Inferential	Text Erroneous	Text Speculative	Total
001	N	36	2	36	0	2	0	38
	E	23	1	23	0	1	0	24
	P	3	0	3	0	0	0	3
002	N	50	2	48	2	2	0	52
	E	36	5	39	0	1	1	41
	P	14	2	9	7	0	0	16
004	N	75	3	73	1	4	0	78
	E	50	0	50	0	0	0	50
	P	28	0	8	20	0	0	28
005	N	138	2	115	4	19	2	140
	E	39	0	24	1	11	3	39
	P	6	0	4	2	0	0	6
006	N	36	0	34	0	1	1	36
	E	15	1	14	0	2	0	16
	P	20	1	19	2	0	0	21
007	N	174	5	135	0	41	3	179
	E	65	2	49	0	18	0	67
	P	19	2	16	1	3	1	21
008	N	22	1	19	3	1	0	23
	E	14	0	7	3	4	0	14
	P	9	0	5	4	0	0	9

* Pilot test subject 003 was unable to participate in this part of the pilot research due to early release from school to accept a position in her chosen trade.

Passages read include: 1. The Homesick Buick (N)
2. Crocodilians (E)
3. Don't Let Stereotypes Warp Your Judgment (P)

Table 3.5 indicates that 't' unit production for the most part tended to be higher for the (N) passage, which is not surprising as it was the longest selection. However, the number of 't' units generated by this passage varied substantially among subjects ranging from a low of 36 to a high of 174. Similar trends can be noted when the data for the E and P passages are examined.

In terms of the more specific categorization of responses it can be observed by examining the data table that Text Specific responses tended to predominate, a fact which can probably be accounted for by the immediacy of recall. However, the variation in responses of an inferential nature is quite marked. The number of inferences generated varied from a low of 0 by subject 001 to a high of 20 by subject 004. It must be noted that it is the (P) passage, where an argument is presented, which is most notably responsible for the inference generation by subjects 002 and 004. Also of interest, were the number of erroneous responses given by subjects 005 and 007.

This was the first indication that the prospective passages selected for the phase II research would indeed point out individual differences.

Some examples of the different response types follow.

Text Specific

SRUR (N): The name of the town in this story is Leaman, Texas.

Crocodilians is the name that encompasses both crocodiles and alligators.

Text Inferential

SRUR (P): If you think you have to live in the world of middle economy, you're expected to have perhaps two cars, one nice and one practical. You dress in the right clothes. You get your hair done by the right people. You always look nice.

Although this passage is about stereotyping, none of the above information is specifically given.

SRUR (N): The woman was blond and, of course, looked a bit hard.

Text Erroneous

SRUR (E): I think the alligator is found in the United States and the crocodile is in Florida.

SRUR (N): This passage takes place in Leaman, Texas, in the 1930's.

Actually the story takes place in 1949.

Text Speculative

SRUR (N): This story is going into an awful lot of detail.

SRUR (P): I admit I stereotype people. Everybody does it.

Some of the subjects compared passages. One subject noted: "This (referring to the passage entitled Crocodilians SRUR (E)) wasn't as interesting as the other one (referring to the Homesick Buick SRUR(N)) because that was a story. This passage on crocodiles and alligators is just facts".

Some subjects exhibited frustration and verbally admitted this was the case. While reading the SRUR (E) passage one subject noted "There's a doctor named Alexander who published oh, I shouldn't say the -------- yes, he published some kind of theory put out about crocodiles".

Here the subject is confusing passage information as he is referring to an explorer named Alexander Von Humboldt who made the most reliable measurement of a crocodile. At these times this subject exhibited moments of frustration and would say "See. Now I'm getting confused". Other subjects exhibited similar behaviours.

Due to the nature of the responses elicted from the subjects who read the SRUR passages, a decision was made to use them in the phase II research. Subjects participating in the pilot study were then asked to read the silent reading interrupted passages. Table 3.6 summarizes the data collected.

As Table 3.6 indicates, again it is the N passage which in all cases produced the largest number of 't' units. However, the P passage, in most cases (seven out of eight) produced the second largest number of analyzable units. Moreover, the N and P passages produced the largest number of inferential responses, although subject 004 did generate five inferences on the E passage. Because these passages were not read in their entirety but in chunks or sections predetermined by the researcher, subjects were asked to make predictions or hypotheses starting with the title and after that prior to reading each section or piece of passage. Table 3.7 shows the number of hypotheses generated on each of the passages by participants in the pilot test group.

TABLE 3.6

Silent Reading Interrupted Recall (SRIR)
Pilot Test Results for Subjects According to
Subject Passage Format and Response Type

Subject No.	Passage Type	't' Units	Incomplete 't' Units	Text Specific	Text Inferential	Text Erroneous	Text Speculative	Total
001	N	72	2	70	2	1	1	74
	E	25	2	27	0	0	0	27
	P	36	1	37	0	0	0	37
002	N	50	2	48	2	2	0	52
	E	36	5	39	0	1	1	41
	P	14	2	9	7	0	0	16
003	N	39	0	32	4	1	2	39
	E	18	0	18	0	0	0	18
	P	28	1	27	1	1	0	28
004	N	115	1	77	33	5	1	116
	E	47	0	42	5	0	0	47
	P	86	1	57	28	2	0	87
005	N	115	4	107	0	11	1	119
	E	37	2	35	0	4	0	39
	P	44	4	22	2	24	0	48
006	N	74	2	73	0	3	0	76
	E	41	0	37	3	1	0	41
	P	55	2	48	5	4	0	57
007	N	153	12	139	1	22	3	165
	E	50	4	43	4	10	5	62
	P	120	5	90	3	26	6	125
008	E	27	1	18	6	4	0	28
	P	39	2	30	7	4	0	41

Note: Subject 008 did not read the N passage.

Passages read: 1. The Cathird Seat (N)
2. The Desensitization of Twentieth Century Man (E)
3. Exploring the Unknown (P)

TABLE 3.7

Hypotheses Generated by Subjects On the SRIR Passages

Subject Number	Passage Type	Number of Sections	Number of Hypotheses
001	N	10	5 bad tape
	E	5	3
	P	7	3
002	N	10	8
	E	5	5
	P	7	7
003	N	10	8
	E	5	4
	P	7	3 bad tape
004	N	10	8
	E	5	6
	P	7	8 (two on title)
005	N	10	8
	E	5	3
	P	7	6
006	N	10	8
	E	5	4
	P	7	8 (two on title)
007	N	10	9
	E	5	5
	P	7	7
008	N	10	7 (some bad tape)
	E	5	5
	P	7	6

Not only did subjects vary in the number of hypotheses generated, but the accuracy of these hypotheses varied considerably among subjects as well.

The N passages tended to elicit a considerable number of hypotheses from all subjects in the pilot group. This is not surprising since the passage had the largest number of divisions. Perhaps more interesting are the differences revealed in subjects' willingness or ability to hypothesize. Subjects 004 and 007 seemed to be particularly adept at this practice.

Some examples of subject responses in the various categories are given below.

Text Specific.

SRIR (N): It starts off talking about Mr. Martin who bought a package of cigarettes.

SRIR (E): The woman was being mugged or attacked.

Text Inferential.

SRIR (N): And he plans to get rid of her by making her look bad.

This comment is made near the beginning with minimal information.

SRIR (P): But what I gather is that the people have to understand the way the scientist thinks in order to understand why he is creating what he is.

Text Erroneous.

SRIR (N): An ordinary man goes into a store to steal a package of ciagarettes.

SRIR (P): It says that because scientists have never discovered anything material that they refuse to believe anything immaterial.

Text Speculative

SRIR (E): Somehow I get from the title that twentieth century man seems to be saying that there is so much technology in the twentieth century that he's lost sight of who he actually is and I'm not really sure. There's something hanging around there and I can't figure out what it is.

SRIR (N): After reading this passage one subject speculated

> I again . . . I always use this term a classic situation sort of thing I guess where - it's like the other story with Pinky D (SRUR (N)) - how a little scrawny frail little guy somehow comes out on top always, and I think it's a good moral boost to someone who reads it.

This subject is comparing SRIR (N) to SRUR (N).

Since the responses again were quite diverse it was decided to include the SRIR passages in the phase II research.

The SRSR protocols will be discussed in the following pages. This task was designed to examine the effect of information gathered in a cumulative manner by observing student responses to written material at the sentence level.

Table 3.8 shows the results of the qualitative analysis of the SRSR pilot study protocols.

By examining Table 3.8 one can see its most salient feature is the number of speculative statements elicited. Moreover, these statements were not unique to one specific passage type.

Examples of the types of responses are provided below.

Text Specific

SRSR (N): The stewardess smiled at him but he didn't smile back.

TABLE 3.8

Silent Reading Sentence Retrospection Pilot Test Results
According to Subject, Passage Format and Response Type

Subject Number	Passage Type	't' Units	Incomplete 't' Units	Text Specific	Text Inferential	Text Erroneous	Text Speculative	Total
001	N	162	3	149	7	3	6	165
	E	62	1	60	0	2	1	63
	P	60	2	54	1	2	5	62
002	N	191	2	163	25	1	4	193
	E	43	3	15	4	4	23	46
	P	72	4	57	3	1	15	76
003	N	140	2	127	13	2	0	142
	E	43	2	45	0	0	0	45
	P	51	2	47	4	2	0	53
004	N	253	3	179	61	4	12	256
	E	91	3	72	13	1	8	94
	P	101	2	54	17	2	30	103
005	N	138	2	118	6	16	0	140
	E							
	P							
006	N	103	6	103	2	3	1	109
	E	40	4	37	0	5	2	44
	P	43	2	40	3	2	0	45
007	N	193	7	177	0	19	4	200
	E	73	5	61	1	15	1	78
	P	70	5	63	0	10	2	75
008	N	254	5	165	65	20	9	259
	E	76	2	61	3	4	10	78
	P	121	10	92	22	6	11	131

Passages read:
1. The Unpopular Passenger (N)
2. Flies Everywhere (E)
3. Reason Tells us This is Wrong (P)

SRSR (N): They touch down in Cleveland.

Text Inferential

SRSR (N): Maybe something is wrong with one of his family or something.

This subject infers this after reading only a few sentences. This is accurate and true.

SRSR (P): The misuses of sex, such as child pornography, are wrong and that's what makes it evil in many people's eyes.

Text Erroneous

SRSR (E): Butterflies, dragonflies and mayflies come from the word flying, because they fly.

SRSR (N): The gentleman who is sort of describing the story, he finally made out that he had to make a phone call.

Text Speculative

SRSR (P): I bet it was written by a very old preacher. I can't agree with the fact that he's totally against birth control. Besides I disagree with this person's writing.

SRSR (N): I like this because it has a moral. You shouldn't look at somebody and judge them just on the basis of what you see. You should really know what's going on and I found this put the point across very well. It's sort of like a reverse ending. You thought at the beginning that somehow this little man would receive back what he "dished" out. And that's what everybody in the limousine wanted too. But it got the point across in the end that the reasons why people do things are not always what they appear.

Again these passages yielded a wealth of data related to all response types so it was decided to incorporate them into the phase II research.

Summary

This concluded the analysis of the pilot test material. Based on the diversity of responses given to the various passages and the eagerness of pilot test subjects to participate in the reading tasks, it was considered appropriate to use both the material selected and the researcher designed tasks with phase II subjects. It will be recalled that the vocational subjects used in the pilot test were similar in age, grade level, and background to the subjects participating in the next phase of the study. The qualitative analysis of phase II subject responses is reported in Chapter 5.

Having successfully pilot tested the passages and having checked the adequacy of the researcher designed tasks, phase II of the research was begun.

The findings of the phase I research will be discussed in Chapter 4. The results of the phase II analyses will be reported in Chapter 5.

CHAPTER 4

QUANTITATIVE ANALYSES

In order to examine the relationships between information integration and reading and more specifically cognitive planning and reading, the data collected on the subjects who participated in the phase I research was subjected to a number of statistical analyses. The methods employed and the results of the findings will be reported in this chapter.

Factor Analyses

Table 4.1 shows the results of the factor analysis with varimax rotation for all 148 subjects in the phase I research.

In interpreting Table 4.1, Factor I with its high loadings on Ravens Progressive Matrices (.725), the Group Embedded Figures Test (.821) and Figure Copying (.747) would appear to be a simultaneous factor. Previous factor analytic studies (Das, 1979; Heemsbergen, 1980) have produced similar results.

The second factor with loadings on the two serial processing tests, Digit Span (.337) and Auditory Serial Recall (.435) could be a successive factor. This might also be interpreted as a reading factor since the reading

TABLE 4.1

Results of Principal Components Analysis of Measures of Information Integration, IQ, Cognitive Style, and Reading (Varimax Rotation, N = 148)

	Factor		
Variable	I Simultaneous	II Successive	III Miscellaneous
Ravens Progressive Matrices	0.725	-	-
Group Embedded Figures Test	0.821	-	-
Memory for Designs	-	-	0.754
Figure Copying	0.747	-	-
Digit Span	-0.366	0.337	-0.524
Auditory Serial Recall	-0.324	0.435	-0.475
Visual Search Search Time	-	-	0.643
Trail Making (Part B)	-0.306	-	0.572
Cooperative Vocabulary	0.399	0.733	-
Cooperative Level of Comprehension	-	0.833	-
Cooperative Speed of Comprehension	0.318	0.854	-
% Comprehensive Variance	35.881	35.781	28.338
% of Total Variance	22.001	21.940	17.376

Note: Loadings of less than .3 have been eliminated from the analysis for the sake of clarity.

subtests of the CRT all load on Factor II as well (Vocabulary .733; Cooperative Level of Comprehension .833; Speed of Comprehension .854).

The third factor, with loadings on several of the tests, is difficult to interpret. Memory for designs, a simultaneous marker test, loads heavily on this factor (.754). The two successive marker tests, Digit Span (-.524) and Auditory Serial Recall (-.475) have high negative loadings. Moreover, Visual Search (latency) and Trail Making (Part B) which constitute measures of planning, also load on this factor (.643) and (.572) respectively. Although this constitutes an indication of planning, a clear planning factor did not emerge.

It was felt by the researcher that incomplete test data on eight of the subjects could be responsible for the clouded factor III loadings. As a result, the principal components analysis with varimax rotation was rerun eliminating the eight subjects with incomplete profiles. Visual Search (reaction time) was again eliminated from the analysis, but the complete Trail Making score was included. Table 4.2 shows the results of the second factor analysis.

Table 4.2 clearly indicates just how sensitive the factors were to change. The elimination of the eight subjects had a significant bearing on the results. This time a four factor structure emerged.

Factor I with mild loadings on Ravens Progressive Matrices (.365) and Auditory Serial Recall (.311) but with

TABLE 4.2

Results of Principal Components Analysis of Measures of Information Integration, IQ, Cognitive Style and Reading (Varimax Rotation, N = 140) RT Omitted

*

Variable	Factor I Reading	II Simultaneous	III Miscellaneous Visual	IV Successive
Ravens Progressive Matrices	0.365	0.749	-	-
Group Embedded Figures Test	-	0.674	0.320	-
Memory for Designs	-	-	-0.727	-
Figure Copying	-	0.567	0.465	-
Digit Span	-	-	-	0.743
Auditory Serial Recall	0.311	-	-	0.790
Visual Search Search Time	-	-	-0.738	-
Trail Making (Total)	-	-0.705	0.310	-0.410
Cooperative Vocabulary	0.822	-	-	-
Cooperative Level of Comprehension	0.861	-	-	-
Cooperative Speed of Comprehension	0.878	-	-	-
% Comprehension Variance	32.807	26.093	20.887	20.214
% of Total Variance	22.920	18.230	14.593	14.122

* Loadings of less than .3 have been eliminated from the analysis for the sake of clarity.

high loadings on the reading tasks (CRT Vocabulary .822; CRT Level of Comprehension .861; CRT Speed of Comprehension 878) would appear to be a reading factor independent of the other three.

Factor II loading on Ravens Progressive Matrices (.749) as well as the Group Embedded Figures Test (.674) and Figure Copying (.567) appears to be a simultaneous factor.

Trail Making, a planning task, has a high negative loading (-.705) on this factor as well. One explanation of this phenomenon might be that by including parts A and B in the analysis, the test lost its power to discriminate clearly among the planning abilities of the grade IX subjects in the study. More specifically, part A may have been too easy for subjects in this particular sample.

Factor III with a negative loading on Memory for Designs (-.727) and a positive loading on Figure Copying (.465) but with a high negative loading on Visual Search (latency) (-.738) could be a simultaneous/visual factor as distinguished from factor II. However, it has been labelled miscellaneous because of the clouded loadings.

The fourth factor with loadings on Digit Span (.743) and Auditory Serial Recall (.790) appears to be a successive factor. The negative Trail Making loading (-.410) completes the movement of the planning variable over all factors except factor I, which loaded on the reading tasks only. Visual Search is loading on factor III, but this cannot be considered to be a clear planning factor because of the loadings from Figure Copying (.465) and Memory for Designs (-.727) which are simultaneous marker tests. Because the results of the factor analysis did not permit the use of factor scores, it was decided to use raw score data from the visual search test to discriminate between proficient and less proficient planners as this test had high loadings (-.738) on factor III in the second analysis.

One possible explanation as to why this occurred could be the fact that in previous studies all marker tests for planning, successive processing and simultaneous processing are administered in one session. In addition, the tests are administered in a specific order. That is, the planning tasks, as well as the two successive and simultaneous marker tasks, are administered together. Due to the constraints of testing 148 subjects within a school system during regular classroom hours and the subsequent problems related to scheduling testing sessions, it was not always possible to conduct the testing as outlined above. Therefore, it is entirely possible that subjects applied strategies used in one testing situation to another. For example a subject might approach a simultaneous task (Figure Copying) using a planning strategy. This residual effect from a prior testing situation could serve to distort the results and might explain the movements of the planning marker tests across a number of factors.

As previously stated, the results of the factor analyses did not permit the use of factor scores in the subsequent analysis of the data. It was, therefore, decided to use Visual Search Test (latency) raw scores to discriminate between proficient and less proficient planners, as this test had a high loading on factor III (-.738) in the second analysis and because it has also been extensively used in previous research studies to measure planning.

Similarly Auditory Serial Recall was used as the successive marker test with high loadings (.790) on factor IV in the second analysis and Figure Copying was selected as the simultaneous marker test with a satisfactory loading (.567) on the simultaneous factor in analysis two. The second factor analysis was used exclusively in selecting the marker tests to be used because all subjects in this analysis had complete test profiles.

ANOVA Analyses

To explore further the interrelationships between planning, other aspects of information integration, and reading ability, a three way analysis of variance was performed on the data. A median split was executed on the raw score data from the Visual Search (planning), Auditory Serial Recall (successive), and Figure Copying (simultaneous) marker tests. This resulted in a 2 x 2 x 2 design (planning x successive; planning x simultaneous; successive x simultaneous).

The three way analysis of variance was run three times. The vocabulary, speed of comprehension, and level of comprehension measures of the Cooperative Reading Test were used separately as dependent variables. Table 4.3 shows the results of the first three way ANOVA with vocabulary as the dependent variable.

TABLE 4.3

Analysis of Variance Summary Table for Planning (A) X Successive Synthesis (B) x Simultaneous Synthesis (C) with Vocabulary as the Dependent Variable

1. Dependent Variable: Vocabulary

Source	SS	d f	M.S.	F ratio	Prob.
A (Planning)	4.361		4.361	0.081	0.776
B (Successive)	429.931		429.931	8.004	0.005**
C (Simultaneous)	265.175		265.175	4.937	0.028*
AXB	9.041		9.041	0.168	0.682
AXC	98.533		98.533	1.834	0.178
BXC	234.983		234.983	4.375	0.038*
AXBXC	1.766		1.766	0.033	0.856
Residual	7089.937	132	53.712		

* .05 level of significance
** .01 level of significance

An examination of the ANOVA for vocabulary shows significant main effects for simultaneous and successive synthesis and a significant interaction between the two variables indicating a relationship between vocabulary as measured by the Cooperative Reading Test and the two cognitive coding processes. The nature of the interaction is explored in Table 4.4.

TABLE 4.4

Cell Means of 3 Way ANOVA
Size of N for Each Cell is in Brackets.

		Simultaneous High	 Low
Successive Auditory Serial Recall	High	33.16 (50)	28.13 (32)
	Low	26.92 (24)	27.09 (34)

Table 4.4 indicates that students who were high in both successive and simultaneous processing performed best in the vocabulary measure. Those who were low in both processing abilities fared poorly. However students who were low in successive processing were poor in vocabulary irrespective of whether or not they were high in simultaneous processing ability.

Table 4.5 shows the results of the second three way ANOVA with speed of comprehension as the dependent variable.

TABLE 4.5

Analysis of Variance Summary Table For Planning (A) x Successive Synthesis (B) x Simultaneous Synthesis (C) with Speed of Comprehension as the Dependent Variable

2. Dependent Variable: Speed of Comprehension

Source	SS	df	M.S.	F ratio	Prob.
A (Planning)	217.337		217.337	12.794	0.097
B (Successive)	510.542		510.542	6.562	0.012*
C (Simultaneous	102.608		102.608	1.319	0.253
AXB	97.850		97.850	1.258	0.264
AXC	17.229		17.229	0.222	0.638
BXC	131.176		131.176	1.686	0.196
AXBXC	0.152		0.152	0.002	0.965
Residual	10269.192	132	77.797		

*.05 level of significance.

The second analysis shows a significant main effect relating successive processing to speed of comprehension but no significant two way or three way interactions. Since speed of comprehension is the score received on all 60 items of the comprehension test as opposed to the first 30, which measure level of comprehension only, it is possible that high successive subjects skipped questions which caused them difficulty, opting for those types of questions which had responses more compatible with their processing strengths.

Although there were no significant two way or three way interactions the cell means for the second ANOVA are reported in Table 4.6 Examination of the means reveals the impact of successive synthesis on speed of comprehension.

TABLE 4.6

All Means for Subjects in 3 Way ANOVA
Who Were Above and Below the Median
on the Dependent Variable Speed of Comprehension

	Speed of Comprehension	
	High	Low
Planning (Visual Search)	29.10 (70)	25.47 (70)
Successive Synthesis Auditory Serial Recall	29.17 (82)	24.62 (58)
Simultaneous Syntheses (Figure Copying)	28.95 (74)	25.42 (66)

Note: The size of N is reported in brackets below the means.

The third ANOVA was computed using level of comprehension as the dependent variable. The results are shown in Table 4.7.

The third analysis shows a significant main effect for simultaneous processing in relation to comprehension as expected from previous studies; but there is also a significant main effect for planning in relation to level of comprehension as well.

TABLE 4.7

Planning (A) X Successive Synthesis (B) X Simultaneous Synthesis (C) With Level of Comprehension as the Dependent Variable

3. Dependent Variable: Level of Comprehension

Source	SS	d f	M.S.	F ratio	Prob.
A (Planning)	1444.844		144.844	4.483	0.036*
B (Successive)	98.395		98.395	3.045	0.083
C (Simultaneous)	123.991		123.991	3.837	0.052*
AXB	11.222		11.222	0.347	0.557
AXC	94.701		94.701	2.931	0.089
AXBXC	4.674		4.674	0.145	0.704
Residual	4264.971	132	32.310		

* .05 level of significance

The Cooperative Reading Test Manual For Interpreting Scores suggests:

> The first reading score is based on the number of items the student answers correctly out of the first 30 items in Part II. Since experimental tests have shown that most students have time to try all of these 30 items, this is mainly a power score representing level of comprehension (ETS Manual, p. 6).

Although there were no significant two way or three way interactions, the cell means from the analysis are reported in Table 4.8.

TABLE 4.8

Cell Means for Subjects in 3 Way ANOVA
Who Were Above and Below the Median on the
Dependent Variable Level of Comprehension

	Level of Comprehension High	Low
Planning (Visual Search)	19.21 (70)	16.20 (70)
Successive Auditory Serial Recall	18.67 (82)	16.34 (58)
Simultaneous Figure Copying	19.18 (74)	16.06 (66)

Note: The size of N is reported in brackets below the median.

Examination of the cell means again indicates the significant main effects of planning as measured by the Visual Search test and simultaneous processing as measured by Figure Copying on level of comprehension. As stated previously there were no significant two way or three way interactions.

The subjects' mean scores on the reading subtests of the CRT in relation to their performance on the information integration marker tests is reported in Table 4.9.

TABLE 4.9

Mean Scores on Reading Subtests of the CRT For Groups Divided into High (Above the Median) and Low (Below the Median) on the Information Ingegration Marker Tests.

	Reading Subtests			
Cognitive Marker Tests	VOC	Speed of Comprehension	Level of Comprehension	N
Planning (Visual Search)*				
High	29.94	29.10	19.21	70
Low	28.99	25.47	16.20	70
Successive (Auditory Serial Recall)				
High	31.20	29.17	18.67	82
Low	27.02	24.62	16.34	58
Simultaneous (Figure) Copying)				
High	31.14	28.95	19.18	74
Low	27.59	25.42	16.06	66

* Scores below the median on the Visual Search Test (Planning) reflect fast times.

Examination of Table 4.9 indicates that subjects proficient in planning fared well on the level of comprehension measure of the CRT as did subjects high in simultaneous processing. High Successive subjects performed better on the vocabulary and speed of comprehension measures.

Information Integration Group Placement

To examine the relationship between information integration and reading ability and more specifically planning proficiency and reading, each of the 140 subjects who participated in the phase I research was assigned to one of eight information integration groups by performing a median split on the raw scores attained on the Visual Search test (planning), Auditory Serial Recall task (successive processing) and the Figure Copying task (simultaneous processing). The median scores as well as the means and the range of scores are presented in Table 4.10.

TABLE 4.10

Method for Assigning Subjects to Information Integration Groups

Cognitive Process	Marker Test	Median	Mean	Range Low	Range High
Planning	Visual Search (latency)	1.42*	1.648	6.52 -	.44*
Successive	Auditory Serial Recall	67.00	66.742	22 -	85
Simultaneous	Figure Copying	19.00	18.371	6 -	24

* Note: Low scores on Visual Search (latency) represent fast times.

All subjects were assigned to one of the eight information integration groups in this manner. Table 4.11 illustrates how this classification system worked.

TABLE 4.11
Classification System for Assigning Subjects to Information Integration Groups

Subject	Planning* (Median 1.420)	Successive Processing (Median 67)	Simultaneous Processing (Median 19)	Information Integration Group
017	.91	71	24	HHH
041	1.34	52	15	HLL
034	1.19	65	22	HLH
075	.94	68	18	HHL
029	2.05	64	21	LLH
050	1.85	74	23	LHH
001	1.56	70	14	LHL
006	1.71	37	18	LLL

Information Integration Groups

High Planning High Successive High Simultaneous	HHH
High Planning Low Successive Low Simultaneous	HLL
High Planning Low Successive High Simultaneous	HLH
High Planning High Successive Low Simultaneous	HHL
Low Planning Low Successive High Simultaneous	LLH
Low Planning High Successive High Simultaneous	LHH
Low Planning High Successive Low Simultaneous	LHL
Low Planning Low Successive Low Simultaneous	LLL

*Scores below the median on planning represent fast times.

When all subjects had been assigned to an information integration group, the 140 participants in the study fell into the category placement indicated in Table 4.12.

TABLE 4.12

Size of N for Eight Information Integration Groups

Group N = 140		Size of N
High Planning High Successive High Simultaneous	(HHH)	34
High Planning High Successive Low Simultaneous	(HHL)	10
High Planning Low Successive Low Simultaneous	(HLL)	11
High Planning Low Successive High Simultaneous	(HLH)	15
Low Planning High Successive High Simultaneous	(LHL)	16
Low Planning Low Successive High Simultaneous	(LLH)	9
Low Planning High Successive Low Simultaneous	(LHL)	22
Low Planning Low Successive Low Simultaneous	(LLL)	23

After all subjects had been placed into one of the eight information integration groups, the medians on the subtests of the Cooperative Reading Test were examined. The median scores used to classify these subjects according to reading ability as well as the means and the range of scores are reported in Table 4.13.

Subjects in each of the information integration groups were classified as being above (+) or below (-) the median on the vocabulary, speed of comprehension, and level of comprehension measures. Table 4.14 explains this procedure more fully.

TABLE 4.13

Medians Used to Classify Subjects
According to Reading Proficiency
(Subtests of the Cooperative Reading Test)

Subtest	Median	Mean	Range Low - High
Vocabulary	29.00	29.464	13 - 55
Speed of Comprehension	26.50	27.285	7 - 51
Level of Comprehension	18.00	17.707	3 - 59

TABLE 4.14

Information Integration Groups Score
With Assigned Reading Score
An Example of Scoring Profiles of 140 Subjects

Subjects ID	Subjects' Information Integration Group	Vocabulary	Speed of Comprehension	Level of Comprehension
020	HHH	+	+	+
024	HHH	-	+	+
027	LHH	+	+	+
042	LHH	+	-	-
005	HHL	+	-	-
085	HHL	-	+	+
016	HLL	+	+	+
041	HLL	-	+	-
038	HLH	-	-	-
058	HLH	+	-	-
012	LLH	+	+	+
015	LHH	+	+	+
014	LHL	-	+	-
031	LHL	-	-	-
057	LLL	+	-	+
088	LLL	-	-	-

+ = above median   - = below median

Table 4.14 can be interpreted in the following manner. Subject 020 had a fast time (below the median) on the visual search task (planning) and was above the median on the auditory serial recall (successive) and figure copying (simultaneous processing) tasks. As a result, this student was placed in the high planning, high successive, high simultaneous information integration group. In addition, he was above the median (+) on all subtests of the CRT. On the other hand, subject 016 had a fast time (below the median) on the visual search test (planning) and was below the median on the auditory serial recall (successive) and figure copying (simultaneous) tasks. He was, therefore, placed in the high planning, low successive, low simultaneous (HLL) information integration group. However, subject 016, like subject 020, was above the median (+) on all subtests of the CRT. The remaining subjects were classified in a similar manner.

Having classified all subjects into one of the eight information integration groups by executing a median split on the selected cognitive marker tests, and having classified subjects as being above or below the median on the vocabulary, speed of comprehension, and level of comprehension subtests of the CRT, it was now possible to compute, using simple percentages, the percentage of subjects in each information integration group who were above or below the median on the vocabulary, speed of comprehension and level of comprehension measures. Table 4.15 illustrates how this was done using the HLL (N = 11) group as an example.

Using the above procedure, information integration group placement could be compared on a percentage basis with Cooperative Reading Test performance. Table 4.16 shows the results of this comparison.

By examining Table 4.16 valuable insights can be gained into the relationship between reading and information integration. As might be suspected, the HHH group performed the best on all reading tasks, while the LLL group exhibited the poorest performance on the reading measures.

The Group 2 and Group 3 findings in Table 4.16 appear to corroborate the results of the first 3 way ANOVA reported in Table 4.3. It will be recalled that the results of this ANOVA indicated a significant interaction between simultaneous and successive synthesis in relation to vocabulary performance.

Group 4 and Group 5 results, as reported in Table 4.16, are also interesting in relation to the ANOVA results. When planning scores were high and the coding scores were low (Group 4 HLL Table 4.16) vocabulary and speed of comprehension performance were impaired but level of comprehension scores were not affected as profoundly. In light of the ANOVA 1 findings, Table 4.3 and the ANOVA 2 results, Table 4.5, this is not surprising. The influence of successive processing on vocabulary performance has already

TABLE 4.15

Percentage of Subjects Above Median on Vocabulary, Speed of Comprehension and Level of Comprehension for Information Integration Group 4 (HLL) N = 11

Subject Number	Raw Score Vocabulary	Speed of Comprehension	Level of Comprehension	% Above Median on Vocabulary	% Above Median on Speed of Comprehension	% Above Median on Level of Comprehension
016	29+	33+	23+			
041	27-	16-	09-	45%	45%	55%
044	33+	28+	18+			
059	29+	21-	21+			
072	25-	20-	13-			
086	22-	21-	17-			
095	22-	12-	11-			
097	21-	19-	17-			
124	40+	36+	27+			
125	39+	44+	28+			
136	25-	33+	22+			

TABLE 4.16

Percentage of Subjects Above Median in Vocabulary, Speed of Comprehension and Level of Comprehension For All Information Groups

Group No.	Group	Size of Group	% Above Median on Vocab.	% Above Median on Speed of Comp.	% Above Median on Level of Comp.
1	HHH	34	59%	74%	79%
2	HHL	10	40%	70%	80%
3	LHH	16	88%	63%	69%
4	HLL	11	45%	45%	55%
5	HLH	15	40%	33%	47%
6	LLH	9	44%	44%	44%
7	LHL	22	50%	36%	36%
8	LLL	23	30%	39%	17%

N = 140

been discussed. It will be recalled that the second ANOVA produced a significant main effect for successive processing and speed of comprehension. This result is further confirmed by examining Table 4.16. Low successive, but high planning and high simultaneous scores (Group 5 HLH), resulted in speed of comprehension scores being adversely affected.

When planning scores were low and the scores on the coding tasks were high, the level of comprehension score plummeted, but vocabulary performance remained high. This trend can be observed by comparing (Table 4.16) Group 1 (HHH) to Group 3 (LHH) on the level of comprehension measure.

Table 4.16 also reveals some interesting features regarding Group 6 (LLH) and Group 7 (LHL). When planning and successive scores were low and simultaneous scores were high, level of comprehension scores suffered; but not too badly. However, when planning and simultaneous scores were low and successive scores were high both speed of comprehension and level of comprehension scores fared very badly but vocabulary performance thrived. As mentioned previously, when performance was poor on all measures of information integration, all measures of reading suffered as well.

Table 4.16 thus tends to substantiate and explain the results discovered in each of the three way ANOVAS. More specifically, vocabulary performance is related to proficiency in simultaneous and successive processing as indicated by the results of ANOVA 1 Table 4.3 and as shown by the performance of Groups 2, 3, and 4 Table 4.16. Speed of comprehension is related to proficiency in successive processing as revealed in ANOVA 2, Table 4.5. Further evidence of this relationship is indicated by the performance of group 5, Table 4.16. Finally, level of comprehension is related to planning ability as well as proficiency in simultaneous processing. This is clearly indicated in ANOVA 3, Table 4.7, and is further substantiated by the performance of Groups 3, 4, and 5 Table 4.16.

To determine if IQ was intervening (table 4.7) to produce the relationships observed in ANOVA number 3 and the percentage Table 4.16, the correlation matrix produced during the second factor analysis was examined. Table 4.17 shows the matrix for all variables.

Results of this analysis indicate correlations between the GEFT and Ravens (.535) and Figure Copying and Ravens (.470). Also noteworthy is the fact that there is a correlation between Figure Copying and the GEFT (.486). This has already been documented in the literature (Das, Kirby, & Jarman, 1979), Heemsbergen (1980). As expected from previous research there is a correlation between the two marker tests of successive synthesis, Auditory Serial Recall and Digit Span (.446). The Cooperative Reading Subtest, Speed of Comprehension correlates with the Cooperative Vocabulary subtest (.638) while the Cooperative Level of Comprehension subtest correlates with both the vocabulary subtest (.623) as well as the Speed of Comprehension subtest (.839). Moreover, the Speed of Comprehension and level of comprehension subtests of the CRT both correlate with the IQ measure employed in the study (.399 and .496 respectively). The relationship between IQ and reading has already been well documented in the literature. The relationship between the measure of IQ used in this study (RPM) and simultaneous processing has already been mentioned. McLeod (1978) has

TABLE 4.17

Correlations of All Measures Administered
to Phase I Subjects
N = 140

	IQ	Cog-nitive Style	Simultaneous Processing		Successive Processing		Planning			Reading	
	RPM	GEFT	MFD	FC	DS	ASR	VS	TM	CRTV	CRTS	CRTL
(RPM)	1.000										
(GEFT)	.535	1.00									
(MFD)	-.273	- .232	1.000								
(FC)	.470	.486	- .260	1.000							
(DS)	.183	.131	- .246	.315	1.000						
(ASR)	.018	.021	- .046	.235	.446	1.000					
(VS)	-.119	-.191	.322	-.344	-.195	-.185	1.000				
(TM)	-.331	-.209	.029	.211	-.201	-.149	.025	1.000			
(CRTV)	.318	.288	-.157	.240	.269	.376	-.109	-.089	1.000		
(CRTS)	.399	.266	-.097	.250	.265	.345	-.117	.230	.638	1.000	
(CRTL)	.496	.331	-.136	.335	.283	.293	-.190	-.210	.623	.839	1.000

Complete test name and abbreviation:

Ravens Progressive Matrices (RPM)
Figure Copying (FC)
Auditory Serial Recall (ASR)
Cooperative Reading Test (Vocabulary) (CRTV)
Cooperative Reading Test Speed of Comprehension (CRTS)
Cooperative Reading Test Level of Comprehension (CRTL)
Group Embedded Figures Test (GEFT)
Digit Span (DS)
Trail Making (TM)
Memory for Design (MFD)
Visual Search (VS)

Note: Correlations > .269 are significant at p < .001.

indicated a relationship between simultaneous processing and reading ability. Of significance here is the fact that visual search, the measure of planning used in this study, was not correlated with IQ.

Summary

It would appear from the results presented in this chapter that planning is related to level of comprehension in its own right. To examine this relationship further, subjects' visual search test scores (planning) were computer sorted and ranked from highest to lowest. The 15 most proficient and the 15 least proficient planners as defined by this measure were contacted three years after the phase I research had been conducted to see if they would participate in additional testing. It was hoped that by administering researcher designed tasks and using the techniques of analytical introspection/retrospection, the relationship between information integration and reading, and more specifically between cognitive planning and reading comprehension might further be enhanced. It is the results of the phase II testing which will be discussed in Chapter 5.

CHAPTER 5

PHASE II RESEARCH RESULTS

Post Hoc Testing on Selected Measures of Information Integration

Following the qualitative analysis of the pilot test protocols reported in Chapter 3, a decision was made to administer the nine passages selected to the very proficient and less proficient planners chosen as a result of the statistical measures employed in Chapter 4. At this time the marker tasks of successive synthesis (Auditory Serial Recall and Digit Span) and simultaneous synthesis (Figure Copying and Memory for Designs) were readministered to the phase II participants. This was done to check the stability of the results over time. The Visual Search Test was not readministered at this point because it required the use of a specialized piece of equipment (Visual Search apparatus) which was not available. There was also a time factor involved in assessing the phase II subjects since they were now out of school and volunteering their time. Because the successive and simultaneous marker tests can be administered in a minimum amount of time and without the use of specialized equipment they were used to establish the stability of the information integration tasks.

Table 5.1 reports the scores on the successive marker test (Auditory Serial Recall) over the two testing periods.

TABLE 5.1

Comparison Between 1980 and 1984 Scores for High and Low Planners on the Auditory Serial Recall Test (Successive Synthesis)

Subject No.	Top or Bottom Planner	1980 ASR Score	1984 ASR Score
016	T	57	66
002	T	82	75
023	T	71	69
024	T	71	78
048	T	67	75
062	T	71	51
068	T	63	60
076	T	57	65
082	T	67	61
115	T	66	71
116	T	67	81
118	T	63	73
128	T	85	83
032	B	73	79
060	B	68	75
064	B	67	70
088	B	62	62
099	B	58	71
110	B	64	62
111	B	64	67

Visual inspection of the table indicates there was some change in the raw scores of subjects over the two testing periods. To further examine the data, a correlation was computed between the 1980 and 1984 scores. The result was a correlation of .4528 > .4438 (N = 20) indicating a significant relationship between the scores achieved over the two testing periods suggesting the stability of this measure over time.

Table 5.2 reports the scores over the two testing periods on Digit Span and Auditory Serial Recall.

Visual inspection again shows some movement of scores. The correlation between the 1980 and 1984 scores on the Digit Span test was .4962 > .4555 (N = 19) indicating stability of this measure.

Stability of the simultaneous measures was examined next. Subjects' scores in 1980 and 1984 on the Figure Copying test are reported in Table 5.3. Visual inspection of this data shows some movement between the two testing sessions. The correlation between these two sets of raw scores (1980 - 1984) was .6575 > .6319 (N = 10) indicating stability over time.

Finally, the scores on the other simultaneous marker test, Memory for Designs, were examined. The raw scores for the two testing sessions are reported in Table 5.4.

7

TABLE 5.2

Comparison Between 1980 and 1984 Scores for High and Low Planners on the Digit Span Test

Subject Number	Top or Bottom Planner	1980 DS Score	1983-84 DS Score
016	T	6	9
023	T	6	6
022	T	7	8
024	T	7	6
048	T	7	7
062	T	5	7
068	T	5	6
076	T	5	6
082	T	5	6
115	T	5	6
116	T	7	7
118	T	6	6
128	T	8	9
060	B	7	6
064	B	7	7
088	B	5	7
099	B	5	6
110	B	5	5
111	B	5	7

TABLE 5.3

Comparison Between 1980 and 1984 Scores for High and Low Planners on the Figure Copying Test

Subject Number	Top or Bottom Planner	1980 FC Score	1983-84 FC Score
023	T	20	21
076	T	20	23
082	T	20	18
116	T	23	24
118	T	23	24
032	B	17	23
060	B	18	24
064	B	13	19
088	B	16	22
111	B	12	16

TABLE 5.4

Comparison Between 1980 and 1984 Scores for High and Low Planners on the Memory for Designs Test (Simultaneous Processing)

Subject Number	Top or Bottom Planner	1980 MFD Score	1984 MFD Score
016	T	0	2
023	T	2	1
076	T	2	0
086	T	2	0
116	T	0	0
118	T	0	4
032	B	0	0
060	B	0	0
064	B	2	0
088	B	0	0
099	B	2	9
110	B	2	4

Examination of the table shows that some subjects' scores changed considerably; particularly subject 099. The correlation between the 1980/84 scores this time was .2510 $< .5760$ (N = 12).

As suspected from visual inspection of the data, this correlation was not significant, indicating the measure was not stable over the two testing sessions.

This concluded post hoc testing of the selected cognitive processing tasks. Three of these, Auditory Serial Recall (successive), Digit Span (successive) and Figure Copying (simultaneous) were stable over the two testing periods; Memory for Designs (simultaneous) was not. It will be recalled that the successive processing task selected for classifying subjects in the phase I research was Auditory Serial Recall while the simultaneous measure chosen was Figure Copying. Both of these tests revealed credible stability over the intervening time period.

Establishment of Inter-rater Reliability

Having established the stability of selected measures of cognitive synthesis, the phase II subjects were administered the passages and tasks outlined in Chapter 3 of the study.

In classifying the responses of the subjects in this segment of the study, the typed protocols were first divided into complete and incomplete 't' units by the researcher and classified as text specific, text inferential, text erroneous or text speculative as outlined in Chapter 3. To verify the reliability of these classifications, the protocols were given to two independent raters. Rater 1 was a speech/language pathologist working at an elementary school and rater 2 was a high school biology/English teacher. Each rater randomly selected two passages, from the total number of protocols which accrued from the Pilot

Test and phase II research testing. The results of these raters' analyses in relation to the researcher's findings are presented in Table 5.5.

As can be seen by examining Table 5.5, the percentage of agreement between the researcher and protocol raters 1 and 2 approximated 90 percent. After establishing the reliability of the classification system, the protocol material on phase II subjects was analyzed and classified into appropriate categories.

Table 5.6 shows the planning, successive and simultaneous processing abilities of phase II subjects. It will be recalled that they were selected by computer according to their visual search times (planning).

Table 5.6 indicates that of the 20 phase II subjects participating in the study, 13 were very proficient planners (fast visual search times) while seven were less proficient planners (slow visual search times). Further examination of the table also shows that not all information integration groups were represented. However, there were subjects who belonged to six of the eight groups. These included HHH (7); HHL (1); HLH (4); HLL (1); LHL (3); and LLL (4). The procedure for classifying subjects into information integration groups was outlined extensively in Chapter 4.

Visual inspection of Table 5.6 suggested the logic of comparing certain groups. More specifically, the HHH (N = 7) and LLL (N = 4) subjects could be compared because they were exact opposites; the HLH (N = 4) and LHL (N = 3)

TABLE 5.3

Percentage of Agreement and Disagreement
Between Researcher and Raters One and Two With Regard To
't' Unit Classification (Text Specific, Text Inferential, Text Erroneous
and Text Speculative)

Subj. No.	Task Type	Passage Type	Total Analyzable Units By Passage	No. of Discrepancies Between Researcher & Rater 1	Total Analyzable Units Over 9 Passages	Total Total Discrepancies Over 9 Passages	% Disagreement Between Researcher & Rater 1	% Agreement Between Researcher & Rater 1
004 (P)	SRUR	N	78	4	890	94	10.56	89.44
	SRUR	E	51	7				
	SRUR	P	28	4				
	SRIR	N	116	17				
	SRIR	E	47	4				
	SRIR	P	87	8				
	SRSR	N	256	30				
	SRSR	E	94	16				
	SRSR	P	133	4				
088 (R)	SRUR	N	18	2	462	50	10.82	89.18
	SRUR	E	10	4				
	SRUR	P	10	2				
	SRIR	N	72	4				
	SRIR	E	32	4				
	SRIR	P	37	6				
	SRSR	N	174	8				
	SRSR	E	60	8				
	SRSR	P	49	12				

Subj. No.	Task Type	Passage Type	Total Analyzable Units By Passage	No. of Discrepancies Between Researcher & Rater 2	Total Analyzable Units Over 9 Passages	Total Total Discrepancies Over 9 Passages	% Disagreement Between Researcher & Rater 2	% Agreement Between Researcher & Rater 2
003 (P)	SRUR	N	179	22	970	80	8.25	91.75
	SRUR	E	65	8				
	SRUR	P	21	0				
	SRIR	N	165	14				
	SRIR	E	62	4				
	SRIR	P	125	8				
	SRSR	N	200	16				
	SRSR	E	78	4				
	SRSR	P	75	4				
048 (R)	SRUR	N	132	18	730	88	12.05	87.95
	SRUR	E	39	4				
	SRUR	P	22	8				
	SRIR	N	97	16				
	SRIR	E	26	4				
	SRIR	P	32	6				
	SRSR	N	247	8				
	SRSR	E	65	12				
	SRSR	P	70	12				

Note: P Stands for Pilot Protocol
R Stands for Phase II Research

TABLE 5.6

Planning, Successive and Simultaneous Processing Abilities of Phase II Subjects

Subject Number	Planning	Successive	Simultaneous
022	H	H	H
023	H	H	H
024	H	H	H
048	H	H	H
062	H	H	H
116	H	H	H
128	H	H	H
082	H	H	L
068	H	L	H
115	H	L	H
118	H	L	H
076	H	L	H
016	H	L	L
064	L	H	L
032	L	H	L
060	L	H	L
088	L	L	L
099	L	L	L
110	L	L	L
111	L	L	L

subjects because they represented complete mirror images. Finally, the HHL (N = 1) and HLL (N = 1) subjects could be compared, since they differed only on successive processing proficiency.

Qualitative Protocol Analysis Phase II

Subjects in the phase II research were administered the three types of researcher designed reading tasks (SRUR, SRIR, SRSR) and the three types of passages (N), (E), and (P). Examples of subject responses are given below beginning with the SRUR passages. According to the format described earlier, the HHH and LLL responses will be compared. Table 5.7 shows the output of one HHH and one LLL subject who participated in phase II of the research. Both subjects were males and they were selected for the sake of comparison because they both had complete protocols and their responses were typical of their respective groups.

By examining Table 5.7 it can be seen that total 't' unit production by the HHH subject (048) was greater than that of the LLL (088) participant on all passages except the SRIR (E) and (P) selections. It bears mention that the sound quality of the SRIR tapes for the HHH subject was poor and undoubtedly influenced the outcome.

Perhaps more significant are the reactions of the subjects to the material read. Table 5.8 summarizes the types of responses given.

TABLE 5.7

Total 't' Unit Production by One HHH and One LLL Subject

Subject Number	Task	Passage Type	't' Units	Inc. 't' Units	Total
HHH 048	SRUR	N	121	11	132
		E	38	1	39
		P	19	3	22
	SRIR	N	89	8	97 Bad Tape
		E	24	2	26 Bad Tape
		P	30	2	32 Bad Tape
	SRSR	N	219	28	247
		E	52	13	65
		P	58	12	70
LLL 088	SRUR	N	18	0	18
		E	8	2	10
		P	9	1	10
	SRIR	N	67	5	72
		E	30	2	32
		P	32	5	37
	SRSR	N	164	10	174
		E	55	5	60
		P	41	8	49

TABLE 5.8

Analysis Protocol Output
By Response Type

Subject Number	High or Low Group	Total Text Specific	Total Text Inferential	Total Text Erroneous	Total Text Speculative
048	HHH	625	42	31	32
088	LLL	389	12	72	7

By examining this table, some very interesting quantitative as well as qualitative differences can be observed. Total overall production is substantially higher for the HHH subject. Equally important, he produced over three times as many inferential responses, while the LLL reader produced more than double the amount of erroneous responses. The HHH subject speculated widely on the material while his LLL counterpart seldom did this.

Table 5.9 shows a more in-depth analysis of observed qualitative differences. Examination of Table 5.9 shows that the HHH subject produced considerably more text specific responses on most passages than his counterpart. Moreover, he generated inferences on all passages except SRUR (P) and SRSR (E). The subject low in all areas of information integration failed to generate inferences on SRUR (N) and (E) as well as SRSR (E) and (P), although he

TABLE 5.9

Classification of 't' Unit Responses into Categories for One HHH and One LLL Subject Who are Representative of These Groups

Subject Number	Task	Passage Type	Text Specific	Text Inferential	Text Erroneous	Text Sped.	Total 't' Units
HHH 048	SRUR	N	119	3	7	3	132
		E	32	1	5	1	39
		P	17	0	1	4	22
	SRIR	N	77	8	8	4	97
		E	21	4	0	1	26
		P	25	2	4	1	32
	SRSR	N	214	21	4	8	247
		E	57	0	2	6	65
		P	63	3	0	4	70
Total Response Type			625	42	31	32	730
LLL 088	SRUR	N	17	0	1	0	18
		E	5	0	5	0	10
		P	5	2	3	0	10
	SRIR	N	63	1	8	0	72
		E	21	3	8	0	32
		P	47	4	3	1	55
	SRSR	N	145	2	23	4	174
		E	49	0	11	0	60
		P	37	0	10	2	49
Total Response Type			389	12	72	7	480

did produce more inferential responses in tasks where he was asked to hypothesize. Also noteworthy is the fact that the erroneous responses of the proficient processor remained fairly stable over all reading tasks and passage types while the less proficient processor increased his erroneous responses as he moved from SRUR, to SRIR to SRSR tasks. Passage types (E) and (P) also seemed to be causing him more difficulty than narrative material. Finally, the speculative statements of the HHH subject remained fairly consistent across all tasks and passage types, whereas his LLL counterpart speculated, for the most part, only during the introspective task. This finding, that the inefficient processor produced more inferences when asked to hypothesize, and speculated more widely when asked to introspect, could have some bearing on how subjects, who have poor planning and coding strategies, should be taught reading.

To gain a clearer picture of the types of responses given to the reading material by high and low planners in the HHH and LLL groups, some examples will be provided from various individuals. To more fully reveal these readers as individuals, a brief biographical sketch is presented in Figure 5.1 on each of the HHH and LLL subjects. It will be recalled that by the time the phase II research was conducted they had left the school system.

By examining these profiles a pattern of considerable academic success seems to emerge for the proficient processors. The inefficient processors, with the exception

FIGURE 5.1
Personal Profiles of the HHH and LLL Readers

HHH 022 Age 18. Completed grade XII (academic). Favorite subjects were English and French. Enrolled at Acadia University, Wolfville, NS, to take a B.A. in Library Science.

023 Age 18. Completed grade XII (academic). Favorite subject is Physical Education. Looking for work.

024 Age 18. Had completed grade XII (mixture of academic and general). Math and chemistry were favorite subjects. Wished to pursue a career in science.

048 Age 19. Grade XII (academic except math). Favorite subject was industrial arts. Enrolled at a Vocational School in Motor Mechanics course.

062 Age 18. Completed grade XII (academic). Favorite subjects were biology, math, and chemistry. Enrolled in two year nursing program at Victoria General Hospital.

116 Age 18. Completed grade XII (general). Enrolled in Motor Mechanics course at a Vocational School. Favorite subject was Industrial Arts.

128 18 years old. Completed grade XII (academic). Enrolled in Accounting course at a Vocational School. Favorite subject is math.

LLL 088 Age 19. Last grade completed grade XII. Enrolled in Stock Room course at a Vocational School. Had job at Auto Parts Distributor but got laid off. Thought of going back to school but said he had nothing really planned.

099 Age 17. Favorite subjects were chemistry, English, and math (even though I'm not good at it). Applied to take nursing at Dalhousie University and St. Francis Xavier University but wasn't accepted. Accepted into a dental hygienist course at Nova Scotia Institute of Technology.

110 Age 18. Completed grade XII (academic). Favorite subjects math, computer science, music, and spelling. Accepted at Acadia University - Arts and Education. Wanted to work with Elementary students.

111 Age 18. Completed grade XII (academic). Wasn't sure what she wanted to do. Thought of Katamivik. Wanted to go to police training centre at Holland College but wasn't old enough. Applied to Nova Scotia Institute of Technology but hadn't been accepted.

of subject 110, paint quite a different picture. As examples of the HHH and LLL subjects' comments are given in relation to the passages read in phase II of the research, the reader is asked to refer to Figure 5.1 to refresh his memory on the subject being discussed and to remember that the subject is a person rather than a statistical entity. For the sake of clarity, all subjects will be identified by number. The comments of subjects in relation to the passages follow.

SRUR (N) Text Specific

HHH (048) "It started when the fellow came into Leaman".

HHH (023) "O.k. this story takes place in the 1940's".

LLL (110) "And then one day, they found out that the telephone wasn't working, like out of town".

SRUR (N) Text Inferential

Regarding character Pink D:

HHH (116) "But for being picked on as much as he was when he was younger, he had a brazen attitude, because when he rushed into the hotel room he just more or less demanded his way through".

HHH (048) "He was sort of a black sheep" - referring to the character Pink D.

SRUR (N) Text Erroneous

HHH (048) "Woods had $970.00 in the bank".

LLL (099) "But before that, one of the gangsters had gotten killed in the bank. I think it was Mr. Woods that had hit him down".

This is a complete misrepresentation of what actually happened.

LLL (099) "And the Buick had rolled so many times".

Actually the Buick had never left its place in front of the bank. Such misreadings are cumulative and can have a severe impact on the overall outcome of the reading experience. The researcher wondered just what LLL subject (099) had gained from the passage. After reading, the subject was asked "Did you like that passage?" He (099) responded by saying "Yes I did. It was good. I don't know. It had a lot of ----- I don't know. It just kept ----- I don't know. I just liked it."

Literary appreciation is not usually expressed in such inexact terms.

SRUR (N) Text Speculative

HHH (048) "Oh! I remember something else. The agent was getting pretty discouraged".

LLL (088) Although this speculation is not specifically made in reference to textual material, it is reproduced here because it indicates clearly some characteristics which may influence his reading effectiveness.

"Usually when I read a book I'll read--I'll turn it around and read the back half of it or if I can't get anything from that, sometimes it just sort of leaves you drifting, I'll go to the back page and read the back - and read the last page or the last maybe six pages so I know what the ending is like. Then I'll go to the front, you know. That's sort of weird but I do, do that. I just can't wait. I want to see what happened, even though I don't know where it started from".

Here again the LLL subject is revealing a valuable piece of information related to the fluent reading act. It will be recalled that in discussing the reader as decision maker, impulsivity was considered to be a mitigating factor in reducing dissonance. The reflective individual who could hold and store a number of alternatives was less likely to make an incorrect choice because the decision could be postponed until sufficient data was collected to make an accurate one. By his own admission, this LLL subject appears to be describing himself as an impatient and hasty decision maker which could profoundly affect his reading comprehension.

This completed the analysis of the SRUR (N) passage for the HHH and LLL subjects. The analysis of the SRUR (E) material follows. Again examples are given using a variety of subjects.

SRUR (E) Text Specific

HHH (116) "It said how the nostrils were on top of the nose, way out front, so that way they could be almost totally submerged underwater and still keep an eye on what's going on around them".

LLL (110) "An alligator has a stouter nose than a crocodile".

SRUR (E) Text Inferential

HHH (024) This subject started inferencing after the first line. He noted "Crocodilians is more or less a scientific essay on crocodilians which is not just crocodiles but alligators too, and other reptiles".

HHH (048) "It would be very difficult to get at one to kill it unless you had a bullet because they have a very bony structure except on the underside".

There was a dearth of inferential statements on the part of the LLL subjects. However, they produced a considerable number of erroneous responses to the material.

SRUR (E) Text Erroneous

HHH (048) "They really don't know which is bigger the alligator or crocodile. I think it's 29 feet" (actually it's 25).

LLL (088) "It's just all on crocodiles. The story explained all about the crocodile. That's short for crocodilians".

With this global statement, which is also erroneous, one can see the LLL subject attempting to condense the passage into some meaningful category, but making that category too large for precise understanding. He further exhibited this trait by commenting after reading.

"It was all right. Well at least that there sort of gave you some information on the basic--told you right from the start where you were--I could tell just by reading the first sentence what it was going to be about. Well the first page was all information".

This comment by the LLL subject is particularly interesting in relation to the comment on decision making noted by Audley and quoted in Chapter 2 of this study "Minds appear not to need making up; it is unmaking them which takes time and evidence," (Audley, 1971, p. 62).

SRUR (E) Text Speculative

HHH (048) Having just read the title this subject noted: "Crocodilians. That's a name for alligators, crocodiles and their relatives. We took this in school."

There were no other speculative statements made by subjects on this passage. This concluded the analysis of the SRUR (E) passages for the HHH and LLL selected subjects. The analysis of their SRUR (P) protocols follows.

SRUR (P) Text Specific

HHH (116) "They asked in there if the Irish are hot tempered."

LLL (110) "They say how kids that watch T.V. shows can tell the good guys from the bad guys."

SRUR (P) Text Inferential

LLL (088) "A lot of people say redheads are hotheaded."

HHH (128) This subject began by saying "This article is about stereotyping and how it affects you. When you see somebody you automatically classify them in a certain group."

Subject 128 displayed a characteristic of many of the proficient planners. She was able to quickly get to the heart of the matter and correctly encapsulated the gist of the passage.

SRUR (P) Text Erroneous

LLL (088) This subject referred to the passage title as Don't Let Stereotypes Warp Your Mind" and then noted "It just explained what the title meant. It was like when I was a kid - just girl crazy or something like that".

Having read the passage, it is difficult to understand how subject (088) had reached this conclusion.

HHH (048) "It explains how in a nationality, everybody looks alike."

SRUR (P) Test Speculative

HHH (048) "I had this in school before, It had to do with semantics or something like that. But it's true. Everybody prejudges people and it starts at a really early age."

Inherent in this comment was a trait observed in many of the HHH subjects involving the ability to relate the passage material to previous experiential or background knowledge.

LLL subjects produced no speculative statements in response to this material.

Having examined all SRUR passages, that is Narration, Exposition, and Persuasion, the following trends were noted. The individuals who were proficient in all areas of information integration produced more 't' units and more inferential and speculative statements than subjects who were less proficient in planning and coding strategies. Moreover, the proficient subjects tended to relate information to background experience and to encapsulate the gist of the passage into a few correct and concise statements, which displayed their restructuring and reorganizing abilities. Inefficient processors, as might be expected, produced more erroneous responses.

Silent Reading Interrupted Recall (SRIR)

It will be remembered that on this task, subjects were asked to read the material in predetermined chunks or pieces. Beginning with the title and before each subsequent section, subjects were asked to predict or hypothesize what they thought would happen next.

Examples of responses from a number of the HHH and LLL subjects are given below.

SRIR (N) Text Specific

HHH (116) "Mr. Martin went into the drugstore and bought a pack of Camel cigarettes."

LLL (111) "Mr. Martin, who does not usually smoke, goes out during theatre time and buys a pack of Camel cigarettes."

SRIR (N) Text Inferential

HHH (048) "Well I think he just wanted to use them, (referring to cigarettes), as a decoy."

LLL (088) "I think he is trying to hide something or be inconspicuous or something."

It should be noted here that the group proficient in information integration capabilities produced a number of hypotheses and inferential statements on these passages. The inefficient processors produced very few. The pattern followed was indicative of that produced in Table 5.9. For instance after reading the third section of the SRIR (N) passage The Catbird Seat, the HHH subject speculated "I think he's a schemer. He's not going to kill her". On the other hand, the LLL subject's comment when asked to make a prediction at the same juncture was "I'm not sure yet."

SRUR (N) Text Erroneous

HHH (048) "He strode into the store and pulled out a package of cigarettes, I guess, from his pocket."

LLL (088) "I think Mr. Martin is a lawyer." He is in reality an accountant.

LLL (088) "I think the lady's name is Mrs. Barnes." Her name in truth is Mrs. Barrows.

The erroneous responses of subject 088 started to get him into trouble with regard to figuring out the gist of the story and he became quite clearly confused.

He modified his statements but these modifications usually moved him away from, rather than toward the truth. For example between Section II and the end of Section IV, he moved from the position that Mr. Martin was "some sort of detective" to the equally incorrect assumption "that he's a lawyer."

SRIR (N) Text Speculative

HHH (024) "This story has a lot of twists in it and you have to guess how it's going to end. I like it."

LLL (088) "It's a little fuzzy. I don't know. It's got something to do with the title and I think I'm starting to get it. There's a lot more in there but it sort of just carries on you know---it's something that stands out and you got a little bit of dullness in between."

Comments of this nature indicated to the researcher that the LLL subject was often totally confused by the passage.

Silent Reading Interrupted Recall (E)

SRIR (E) Text Specific

LLL (111) "In a railway station in Connecticut there's a group of people."

HHH (116) "This woman ran into a train station for help because someone was after her."

SRIR (E) Text Inferential

HHH (024) This subject after reading the title The Desensitization of Twentieth Century Man noted "I think the title means that people are less sensitive and the more violent they become the more they lose human values."

HHH (048) "He's getting across the idea that death doesn't seem - or death or being hurt that doesn't seem to be so surprising or doesn't bother you so much."

SRIR (E) Text Erroneous

LLL (088) "It happened at the Stanford Inn."

LLL (111) "Well the title is about the something of twelfth century man."

SRIR (E) Text Speculative

HHH (023) "From the title I thought that the passage might be about mechanization taking over a lot of jobs and making people unimportant but now I think it has to do with the breakdown of society - all the criminal activities and where they exist."

HHH (116) "Everybody's paying more attention to like mass murders, nuclear bombs and all the wars and the people of power trying to knee each other in the back. It's force of habit."

Later on this same subject (116) noted after reading Section V - "Well it's explained the title there--what it meant." The title it will be recalled was The Desensitization of Man.

"If people don't smarten up and realize what's going on, that brutality and violence are just going to become something that happens everyday and no one is going to worry about it."

In this synthesizing statement, subject 116 captures the true essence of the passage. The final SRIR passages to be read were the ones which attempted to persuade. Some examples of responses are given below.

The SRIR (P) selection was entitled Exploring the Unknown (see Appendix C). It essentially pointed out the value of science and was a pro-science article.

After reading Section III HHH subject (048) predicted

"It will probably talk about the good and the bad. I think he might just talk more about maybe the good side. He might talk about how to change the pattern to get people to realize what science is doing for them now."

LLL subject (088) responded after reading the same section

"I don't know. I don't know. It's a little weird."

Reading Section IV of the passage didn't seem to help the LLL subject (088). He stated:

> "Something in there sort of confused me. He said something about -- O.K. you take -- he said how beauty was easier to explain -- ah expletive -- was easier to explain and then you take something useful and explain how that is or it was something to that effect, something like that. It sort of confused me."

This scenario was typical of the types of hypothesis testing strategies employed by HHH and LLL subjects. In this regard, HHH subjects were clearly superior.

SRIR (P) Text Specific

LLL (111) "They talk about scientists discovering bombs."

HHH (062) "He's saying scientists don't want to destroy the world."

Text Inferential

HHH (116) As soon as this subject had read the first section she noted

> "Well, it's going to be about scientists and how scientsts are exploring all the time and trying to find out everything they can about, say, the human body, the things that can harm like cancer and how they can fix it or find ways of curing it."

LLL (088) "Ok. I think it's like if you asked a scientist where we came from he'd say we evolved from an organism, or apes, or something like that."

There were a number of other inferences produced on this passage but these were mainly made by HHH subjects.

The number of erroneous responses produced on this selection were substantial in number.

SRIR (P) Text Erroneous

LLL (110) "All they did (referring to scientists) was discover health."

HHH (048) "I think it's like science has come in the nineteenth century and shown us reason."

Some of the LLL subjects' protocols on this passage were punctuated by comments like that of subject (088).

"O.k. It says there they discover -- oh (explitive) I don't know."

On the other hand HHH subject 023 noted

"I liked that passage very much. He's just trying to convince the reader, whoever is reading it, that the scientists are really good for the world."

Proficient planners were very perceptive and read the passage with a critical eye. In Section III of the SRIR (P) passage the following statement appears:

> Nor is the scientist usually impelled primarily by a desire to make money - though I am sure he looks forward to receiving the monthly paycheck as much as anyone (especially when the fresh Ph.D. today can go out into the first job at $10,000 a year. (Section 3 Exploring the Unknown, Appendix C)

HHH subject 024 revealed his critical eye and insightful nature by noting

"I guess this paper must be old cause where they said scientists would be glad to make $10,000 a year. I bet now they're probably making around $30,000 to $40,000."

This subject was the only reader of this passage to note this figure and relate it to contemporary salary scales.

SRIR (P) Speculative

HHH (048) "Like they know how things work (referring to scientists). Like say an atom in relation to a nuclear bomb. You can't see it but they know what it does. And to the public, they don't really care."

HHH (116) After reading the passage he speculated, "Well I guess I can understand why people are scared of it (referring to science) because when science first came about people didn't understand. You know they were just taking scientists words that it was good, but the bombs that they made, made them just jump to conclusions that all the stuff they made was bad. But once they were looking at it they, you know, could tell it's not all bad. The person that wrote this feels that people should be more sympathetic towards scientists. That they shouldn't fear them because they're all trying to make the world a better place to live in."

This concluded the examination of the SRIR passages. While HHH subjects displayed an ability to hypothesize and speculate on the material read, the LLL subjects tended to have a difficult time just getting through the text. Typical of their hypothesizing abilities are the SRUR (N) passage predictions. It will be recalled that this passage The Catbird Seat was divided into 10 sections by the researcher. HHH subject (048) produced seven hypotheses while reading the N passage. LLL subject (088) produced two.

Silent Reading Sentence Recall Text Specific (N)

HHH (128) "The woman was wearing a fox scarf."

LLL (110) "He asks the driver of the limousine if he can get a cab right away."

SRSR (N) Text Inferential

HHH (048) "He yelled 'I gotta make a phone call' and sits there and snaps his fingers as though he must be used to getting his own way."

HHH (116) "One of the fellows couldn't have been a smoker because the smoke bothered him."

SRSR (N) Text Erroneous

LLL (088) "It's in Clearland." This was an interesting error as the story takes place in Cleveland. Clearland is a small community in Nova Scotia near where the testing was being carried out.

LLL (088) "Somebody fell down on the floor and was looking up at his mistress through coloured eyes."

LLL (088) "The man with the shudder - well he must be shaking or something."

Here LLL subject (088) displayed a trait common to members of his group. He misread the word "stutter" calling it instead "shudder". This obviously comfounded the sense of the passage.

LLL subject 099 had extreme difficulty too. It will be recalled that the prupose of this task was to see, using the technique of analytical introspection, if meaning was being acquired as the reader progressed through the text. Subject 099 produced 158 analyzable units, 130 of which were in the text specific category. There were as well, 24 erroneous statements. Many of these misreadings had to do with character misrepresentations. For instance she noted "The stewardess, the one that he knocked down on the plane, she said she didn't like the guy that was pushing."

This situation, as described, did not occur and is typical of misreadings which resulted in the LLL subject's drawing of incorrect conclusions in relation to the outcomes of the passages. Subject 099 seemed to be aware of her difficulties and they are revealed in some of her speculative statements.

SRSR (N) Text Speculative

LL (099) "They all just felt like doing nothing I guess."

LLL (099) After reading the selection she noted:

"I think I didn't really - I don't know. It was all right I suppose. It just showed this little fat man and didn't have much of a story to it."

HHH (048) "Yeah! I see what he meant now. Maybe he was tired out."

Later on this subject observed: "I know. I always do that to my brother." Here he is referring to the fact that one of the characters in the story permits someone else to enter the limousine first so that he can have the window seat. HHH subject 048 is relating this circumstance to his own experiential background, a common trait exhibited by this group.

Silent Reading Sentence Recall (E)

This informational type passage seemed to cause a considerable degree of difficulty for the LLL subjects. There was a host of times when place names, facts, and figures were misconstrued. They also had difficulty decoding some of the words in the text.

SRSR (E) Text Specific

HHH (048) "There are 85,000 different kinds of flies."

LLL "The larva is called a maggot."

SRSR (E) Text Inferential

No inferential statements were produced by the high or low groups on this category, a fact which is interesting in itself. The responses which came close to this category were classified in the text speculative category, because they involved ruminations about the text in general, rather than specific inferential statements. As stated previously, there were a considerable number of erroneous responses.

SRSR (E) Text Erroneous

LLL (088) "The scientific name is ditriptra or something like that. "Di" means right and "triptra" means wings."

HHH (022) "In Britain there are about 6,200 flies."

SRSR (E) Text Speculative

As indicated previously, there were a number of speculative statements produced.

HHH (048) "I know what a hoover fly is." Later on he noted "Yes their eggs. I've often seen them have you?"

HHH (022) "I think I've seen films on the life cycle of the fly."

At the end of the passage she noted "This was very factual."

Similarly HHH (024) "Well, this wasn't a story or anything. This was a factual presentation.

Finally, HHH subject (062) noted "We took this in biology."

In all cases mentioned above, subjects were actively relating the passage material to their background experience. On the other hand, subjects like LLL (099) offered comments such as:

"I never remember names", "Daddy-long-legs - they say if you kill them it will rain", "I don't know the names."

These statements seemed to do little to enhance the reader's understanding of the material, and if anything, appeared to be examples of frustration. Subject 099 seemed to realize she had difficulty remembering and accepted the fact as was revealed by her comment after reading the passage "It was pretty good. The names and stuff, I'll never really remember."

SRSR (P) Text Specific

HHH (062) "Everything is good to them."

LLL (110) "All our senses bring us pleasure."

SRSR (P) Text Inferential

HHH (023) "I think it's appropriate what he's saying. Simply that we should be able to tell with our own reason what is morally right and what is wrong."

HHH (110) "I guess what it's saying is that all our senses bring us pleasure but none of them have the same amount of responsibility attached to them as sex."

The LLL subjects produced no inferential statements in relation to this selection. However, the number of erroneous responses was considerable. Again the performance of subjects 048 and 088 as defined in Table 5.9 were typical.

SRSR (P) Text Erroneous

LLL (099) "If a person does something wrong, or these pleasures and all of this, if he does something wrong - o.k. I got it. If he goes against what God wants us to do - he - something like - if a man - the guy wanted a girl, a guy wanted to have a family I guess, and that is the way the children should be brought into the world. And if say, someone is raped, then it's going against God's way of having children."

This rambling represents almost a complete breakdown in comprehension. Subject 099 didn't seem to be aware of her difficulties, however, because after reading the selection she noted "I found it sort of interesting. I learned something at least."

LLL (110) "It says these actions are equivalent and can be used because they lack proper information if properly employed for telling man this practice is morally wrong.

SRSR (P) Text Speculative

HHH (048) Responding to the passage sentence "There is nothing evil or warped about sex instinct or pleasure" subject 048 noted "Tell my mother that."

HHH (062) While reading about sex and responsibility, this female subject observed

"But after a while some people give it up, give a baby up or have an abortion or something like that."

When she reached the section on sex and responsibility she said to the female research assistant working with her: "I don't want to talk about this stuff." The subject was encouraged to go on, after which she responded, "Why go on. I don't like talking about this because I think it's private." As a result, further testing was curtailed.

She was the only participant who reacted so emphatically to any of the passage material.

The overwhelming fact gleaned from analyzing the HHH and LLL SRSR (P) protocols, was that clearly the less proficiant planners had tremendous difficulty with the material, while the proficient planners performed considerably better.

This brought to a conclusion the comparison of the HHH and LLL subjects' protocols on the three tasks. The remaining subjects fell into four information integration group categories, HLH, HHL, HLL and LHL. Table 5.10 shows this breakdown by information integration group and subject number.

It was decided to compare the protocols of subjects 068, 076, 115 and 118 to subjects 032, 060, and 064 since they are complete mirror images of each other. Subjects 082 and 016 are discussed separately.

TABLE 5.10

Phase I Placements According to Planning, Successive Synthesis and Simultaneous Synthesis

Subject	H or L Planner	Successive	Simultaneous
068	H	L	H
076	H	L	H
115	H	L	H
118	H	L	H
082	H	H	L
016	H	L	L
032	L	H	L
060	L	H	L
064	L	H	L

High Planning, Low Successive, High Simultaneous in Comparison With Low Planning, High Successive Low Simultaneous

Tables 5.11 and 5.12 show an in-depth look at these subjects in relation to each other.

Examination of Tables 5.11 and 5.12 indicates that subjects differed in a number of ways. The students' biographic profiles are presented in Figure 5.2.

Since the HLH subject 076 had been located but was unavailable to read any of the passages the groups were comparable HLH (N = 3), LHL (N = 3).

Further examination of Tables 5.11 and 5.12, shows that HLH and LHL subjects differed in a number of areas. The first is with regard to the SRUR (N) passage.

FIGURE 5.2

Personal Profiles of HLH and LHL Readers

Information
Integration Group

HLH

115 Age 18. Completed grade XII (academic and general). Favorite subjects were math, English and art. Considered entering Nova Scotia College of Art and Design but decided to enroll in a Cosmetology course at a vocational school.

118 Age 19. Graduated from grade XII (Mixture of academic and general). Had been an army cadet instructor at CFB Gagetown, New Brunswick. Waiting for admission to armed forces as weapons technician.

068 Age 18. Left school in grade IX. Went to work in his father's garage. No favorite subject in particular. Received mechanics license by taking courses at the Nova Scotia Institute of Technology.

076 Age 19. Completed grade XII. Interested in attending Nova Scotia Agricultural College. Extremely interested in farming. Decided to buy into a large farm near his home instead.

LHL

032 Age 19. Repeated grade IX. Failed grade X. Took cooking course at a Vocational School and passed. Was looking for job - had worked for Department of Highways (laborer). While looking he became employed as clerk in a pet store.

060 Age 19. Enrolled in grade XII taking all academic courses except Modern World Problems. Missed too much time so was going to repeat. Favorite course Sociology. Undecided about career.

064 Age 20. Completed grade X. Working as shelf stocker and clean up worker at local supermarket.

TABLE 5.11

Qualitative Results by Subject, Passage Type, and Response Classification for HLH Subjects

Subject Number	Reading Task	Passage Type	't' Units	Inc. 't' Units	Text Specific	Text Inf.	Text Erroneous	Text Speculative
068	SRUR	N	42	13	48	2	4	1
		E	28	1	24	0	5	0
		P	10	1	10	0	1	0
	SRIR	N	168	11	158	7	6	8
		E	47	10	51	3	2	1
		P	43	8	41	0	6	4
	SRSR	N	--	--	--	--	--	--
		E	--	--	--	--	--	--
		P	82	25	86	10	8	3
115	SRUR	N	107	5	97	0	13	2
		E	36	0	30	0	6	0
		P	52	0	25	22	5	0
	SRIR	N	--	--	--	--	--	--
		E	41	3	36	1	2	5
		P	57	4	43	6	3	9
	SRSR	N	273	12	268	10	6	1
		E	--	--	--	--	--	--
		P	--	--	--	--	--	--
118	SRUR	N	26	0	21	0	5	0
		E	36	1	35	0	2	0
		P	15	5	7	13	0	0
	SRIR	N	78	4	36	27	13	6
		E	36	0	25	11	0	0
		P	79	8	62	22	0	3
	SRSR	N	134	10	136	4	3	1
		E	43	3	42	1	2	1
		P	60	5	51	2	2	10

Note: Subject 076 was not available for testing on all passages.

TABLE 5.12

Qualitative Results by Subject, Passage Type
and Response Classification for LHL Subjects

Subject Number	Reading Task	Passage Type	't' Units	Inc. 't' Units	Text Specific	Text Inf.	Text Erroneous	Text Speculative
032	SRUR	N	61	1	57	2	3	0
		E	36	2	24	1	13	0
		P	16	3	2	17	0	0
	SRIR	N	129	13	126	2	14	0
		E	31	4	27	3	5	0
		P	22	10	22	0	10	0
	SRSR	N	--	--	--	--	--	--
		E	49	5	49	0	5	0
		P	46	5	37	0	14	0
060	SRUR	N	36	8	37	0	5	2
		E	20	0	12	0	7	1
		P	9	3	11	1	0	0
	SRIR	N	--	--	--	--	--	--
		E	39	1	30	3	5	1
		P	50	2	43	0	8	1
	SRSR	N	157	3	149	0	11	0
		E	44	2	41	0	4	1
		P	35	17	51	0	1	0
064	SRUR	N	27	2	24	0	5	0
		E	19	2	17	0	4	0
		P	8	0	5	3	0	0
	SRIR	N	91	6	85	5	6	1
		E	35	2	28	6	3	0
		P	38	4	32	8	2	0
	SRSR	N	155	9	154	3	6	1
		E	48	0	38	1	9	0
		P	50	2	39	0	12	1

Note: Subject 032 did not read the SRSR N/E passages.
Subject 060 did not read the SRIR N/E passages.

SRUR (N)

The most obvious difference here is in total analyzable output HLH (193); LHL (135). As a result, the former group produced more text specific responses HLH (166), LHL (118). Because this response type is directly related to textual referents, in the following discussion examples of text specific responses will not be given.

Inferential responses on the SRUR (N) passage were identical; a total of two for each group. The number of erroneous responses however, varied. The HLH group produced 22 whereas the LHL group produced 13. When the total number of classifiable units is taken into account (HLH = 193, LHL = 135), this fact is not significant. The HLH subjects produced three speculative responses; the LHL participants produced none.

SRUR (E)

The SRUR results show again that the HLH subjects produced more text specific responses than their LHL counterparts. Again, this is not surprising since more classifiable units were produced by the HLH group than the LHL (78) subjects. There were few differences in other respects between the two groups except that the LHL group produced more erroneous responses (24) than their HLH counterparts (13).

On the SRUR (P) passage, the HLH group again generated more analyzable units. Substantially more text specific and text inferential responses were produced by HLH subjects, 42 and 35 respectively as opposed to 18 and 21 respectively by the LHL participants. The HLH group had six erroneous responses, the LHL had none. There were no text speculative statements by either group.

SRIR (N)

The SRIR (N) passage generated more analyzable units for the HLH group than for their LHL counterparts, 261 as opposed to 239. One student from each group did not read this passage, so the results are comparable. The HLH subjects produced more inferential responses; 34 as opposed to seven. With regard to erroneous units both groups were practically equal (HLH 19; LHL 20). In the area of speculative responses, the HLH subjects produced 14; the LHL subjects one.

On the SRIR (E) passage the HLH subjects again produced more analyzable units than the LHL group. This trend continued with text specific responses (HLH 112; LHL 85). Inferential responses differed little between the two groups; 15 for the HLH group, 12 for the LHL subjects.

Typically the HLH groups produced more analyzable units (190) on the SRIR P passage than the LHL subjects (126). This trend continued with the HLH group generating 146 text specific responses as opposed to 97 by the LHL subjects. It was in the text inferential category, however that major differences were again noticed between the two groups. The HLH participants produced 28, the LHL group eight. The same pattern continued with speculative responses, the HLH subjects tallying 28; the LHL students managed eight.

SRSR

Not all HLH subjects had the opportunity of reading the SRSR passages. Subject 068 did not read the (N) and (E) passages, while subject 115 did not complete the (E) and (P) passages. On the other hand, LHL subject 032 did not read the SRSR (N) passage.

SRSR (N)

The HLH subjects who read the SRSR (N) passage produced a total of 429 analyzable units, the LHL group 324. The total text specific responses were 404 for the HLH subjects and 303 for the LHL group.

SRSR (E)

Only one of the HLH subjects (118) read the SRSR (E) passage. He generated one inference. Of the three LHL subjects who read this passage, only one inference was generated as well.

Subject (118) who read the SRSR (E) passage produced two erroneous responses. The three LHL members generated 18. With regard to speculative statements on the SRSR (E) passage, the student from the HLH group (118) produced one, while the combined output of the three LHL subjects was one.

SRSR (P)

The last passage to be examined in the paried HLH and LHL groups was the SRSR (P) selection. It must be noted that subject 115 in the HLH group did not read this selection and subject 118, also in the HLH group, had a noisy tape making it impossible to transcribe some of the data.

All LHL subjects read this selection although 060 had a noisy tape making some of the transcription difficult.

Even though subject 115 in the HLH group did not read the SRSR (P) selection, this group still generated more analyzable units. This included 137 text specific units, as opposed to 127 for the LHL group. Inferential statements totalled 12 for the HLH subjects and 0 for the LHL group. With regard to erroneous units, the HLH student produced 10 while the LHL subjects generated 27. It will be recalled that this was the case even though the HLH group generated more overall 't' units and in spite of the fact one of the subjects did not read the selection.

Finally HLH subjects produced 13 text speculative responses while the LHL group generated one.

This concludes the comparison of the matched HLH and LHL groups. An indepth comparison of the protocols of two of these subjects follow. Subject 118 from the HLH group and subject 064 from the LHL group were selected for the analysis because they both had complete protocols. Both subjects were males. Table 5.14 shows a comparison of their output.

TABLE 5.13

Comparison of One HLH and One LHL Subject According to 't' Unit Production and Response Type

Group	Subject Number	Reading Task	Passage Type	't' Units	Inc. 't' Units	Text Specific	Text Inf.	Text Erroneous	Text Speculative	Total
HLH	118	SRUR	N	26	0	21	0	5	0	26
			E	36	1	35	0	2	0	37
			P	15	5	7	13	0	0	20
		SRIR	N	78	4	36	27	13	6	82
			E	36	0	25	11	0	0	36
			P	79	8	62	22	0	3	87
		SRSR	N	134	10	136	4	3	1	144
			E	43	3	42	1	2	1	46
			P	60	5	51	2	2	10	65
		TOTAL				415	80	27	21	543
LHL	064	SRUR	N	27	2	24	0	5	0	29
			E	19	2	17	0	4	0	21
			P	8	0	5	3	0	0	8
		SRIR	N	91	6	85	5	6	1	97
			E	35	2	28	6	3	0	37
			P	38	4	32	8	2	0	42
		SRSR	N	155	9	154	3	6	1	164
			E	48	0	38	1	9	0	48
			P	50	2	39	0	12	1	52
		TOTAL				422	26	47	3	498

SRUR (N)

Both subjects produced roughly the same number of analyzable units on the SRUR (N) passage. HLH (118) = 26; LHL (064) = 29. There was little difference in the responses elicited on this passage. The HLH subject produced 21 text specific and five text erroneous responses. The LHL subject produced 24 text specific and five erroneous responses.

SRUR (E)

The pattern changed a bit on the SRUR (E) passage. The HLH subject (118) produced substantially more analyzable units, 37, than his LHL (064) counterpart who generated only 21.

Some of the LHL subjects statements clearly showed he had confused the subject matter. At one point he (064) incorrectly noted: "And then they talked about crocodiles, alligators--no mostly about crocodiles--because an alligator is just another form of crocodile."

After reading the passage the HLH subject commented, "So basically in some ways they're kind of primitive, but in other ways they're quite advanced." The LHL subject simply stated "I liked it."

The final SRUR passage was the (P) one. Again the HLH subject (118) produced more analyzable units than his LHL (064) counterpart; 20 as opposed to eight. Equally significant is the fact that the HLH subject generated 15 inferences while the LHL subject generated three. Examples of inferences generated by the proficient planner included statements like:

> "Basically what I'm trying to say is like a truck driver right? You look at a truck driver. He could be all scrungy and what not and always talking on a C.B. and things like that right. You happen to be, well, say a lawyer. O.K. If you're studying all the time you'll start thinking what a lawyer does all day, what a lawyer has to do!"
>
> "If you're a rich person, you'd think you'd have to go to a lot of country clubs, and socialize, and be a snob."
>
> "O.k., now snob. I get a stereotype right there, you know. I think it's someone like that."

The LHL (064) subject noted regarding stereotyping: "It happens a lot in school to people new in class, like I've done it myself sometimes."

The proficient planner (118) however related this to previous school experience. He noted "I've done it before in sociology."

SRIR

It will be recalled that the SRIR selections were read in sections. The subject was asked to make a prediction as to what he thought the passage was about, beginning with the title and then after reading each predetermined section.

On the SRIR (N) passage the HLH (118) and LHL (064) subjects produced exactly the same number of predictions, eight in all. Examples follow:

HLH subject after reading Section I. "He's going to try to find something and nail her with it."

After reading Section II "I'm not totally sure. It seems like this woman is not doing any good to the firm. I think her name is Mrs. Bowers, but then I'm not sure. It seems like she is maybe some sort of con artist of some sort. That is it."

Later at the end of Section IX "Something will probably end up backfiring. I couldn't tell you how, but it seems like everything is going too smooth for him. Most stories always end up, you know, the bad guy always loses and the good guy always wins or something. So something's going to happen. It's going to blow up in his face and he's going to get fired instead of her."

This prediction clearly does not come to pass.

The LHL (064) subject seemed to quickly adapt to this story. Although he could not make a prediction based on the title, he did speculate after Section I "Well I think he'll lose his nerve later on, but he plans on killing her."

After reading Section III he noted "Well my first assumption was that he was going to try to kill her, but now I think he's just going to try to get her fired from her job."

However, he lost this predicting accuracy after reading Section V where he speculated "I think he's going to bump her off."

At the end of Section VII he still concluded "I think he's going to knock her off." The correct hypothesis he had generated at the end of Section I was now lost.

The types of responses made by each subject varied considerably on this passage. HLH subject (118) produced 82 analyzable units, 36 of which were text specific, 27 of which were inferential, six of which were erroneous and 13 of which were speculative. Examples of inferential statements include Section I "And then the word 'case' came out, so I though maybe he's a lawyer."

Section IV "So I'm not sure to think if this guy is serious--if he is a lawyer of some sort thinking this, or if he's just kidding around when he is saying this, or if he is really tryíng to kill her or what it is for sure."

Section VI "You know, if this man is not supposed to drink or smoke, you're not going to use him as a main suspect."

Speculative statements by this subject included comments such as:

"It looks like he's got quite a plan."

"He's got every detail covered."

"I finally got this cleared up here."

The LHL (064) subject produced 97 analyzable units. Eight-five of these were text specific, five were inferential, six were erroneous and one was speculative. Clearly the major differences between the HLH and LHL subjects relates to the difference in the number of inferential and speculative statements. The LHL subject (064) gave a much more verbatim recall than his HLH (118) counterpart.

Some examples of inferences produced by the LHL subject were statements such as Section V: "He was thinking of how much pressure would be on him or how much pressure was on him before he finally did it."

Section VI: "He's not that kind of guy."

After reading this selection the HLH (118) subject noted "It was half interesting. I liked the way it made me believe one thing and then all of a sudden believe another thing and confuse me and then it straightened itself out in the end."

The LHL (064) subject commented "It was O.K. Like the further you read it the more you liked it, but the first part was kind of boring, you know."

Both subjects generated approximately the same number of analyzable units on the SRIR(E)passage; HLH (118) 36, LHL (064) 37. Neither subject could adequately decode the word desensitization. In terms of predictions, the HLH subject generated four. It should be noted that the researcher neglected to ask him his prediction on the title. The LHL subject produced three. In all cases he was asked what his predictions were. However, he was unsure after sections III and IV. Some examples of the subjects' predictions follow.

HLH (118) After Section I "He'll probably chase after this guy or maybe he'll pick up the woman and find what is going on."

Before reading section III "I'm not exactly sure. Probably he will suggest something about another pursenapping or another robbery or something that has happened probably discussing why he can't understand why the people are acting unconcerned and what not."

Subject 118 noted after Section IV "Probably that if this keeps up, eventually, you know, since people are not really taking a step forward to stop the way people are thinking that mankind would probalby end with self destruction."

These predictions are clearly accurate, thoughtful, and totally relevant to the content of the passage.

The LHL subject (064), as noted, had some difficulty generating hypotheses near the end of the passage.

After reading the title he noted, "It's about twentieth century man. The way man has progressed since the twentieth century." When he had read section I he speculated, "Well I figure that the guy who's telling the story to me will chase the guy and he's going to try to get her wallet back or purse or valuables."

His prediction before section III was: "He might look into why people don't really care or why people don't really do anything and let these robbers attack people."

No other predictions were made by this subject.

Equally important again are the types of responses generated by the subjects. The HLH (118) subject produced 215 text specific responses and 11 inferential ones. Examples of inferential statements include: Section III,

"And music has a lot of violence." "Somebody getting shot in broad daylight could mean a lot in a small town like ours nowadays, but maybe in a big place like Toronto or New York, seeing that happen may not mean quite as much because there are always reports on the radio everyday about murders."

The LHL (064) subject produced the following inferential statements.

Section III, "They don't want to get involved. They're scared they'll get hurt themselves. They think more of themselves than the poor person it's happening to."

Section V, "They probably weren't taught any better. Like they probably grew up in the slums."

The final SRIR passage to be read was the (P) selection. Both subjects were again asked to make predictions on the title and subsequent sections. The HLH subject (118) produced five predictions even though some of his tape could not be transcribed because of noise. The LHL (064) subject generated four predictions.

After reading the title, the proficient planner noted,

"It could be an adventure of some sort into the jungle or a place where no man has been before." The less proficient planner noted about the title, "It could be almost anything - something you don't know nothing about or much about."

The HLH subject suggested after completing section I

"He might give maybe a few definitions of what progress has been made in experiments and what not. It may give a few examples."

The LHL (064) made no prediction on this section.

On completion of Section IV, the HLH subject predicted,

> "It will probably go on about--it will probably defend the scientist a bit more, maybe comparing him to an artist in different matters."

On the same section the less proficient planner noted,

> "Well, it's hard to say. Like he might try to explain why a scientist does what he does you know. I don't know."

The number of analyzable untis produced by the HLH subject (118) on this passage was 87 in spite of the fact that there was some tape missing. The LHL (064) subject produced 42.

Of the 87 units produced, the proficient planner produced 62 text specific, 22 text inferential, no erroneous and three speculative statements. Examples of inferential statements follow:

> "Section I, Exploring the Unknown, isn't about the jungle", (referring to his original prediction based on the title). "It's about mathematical laws, you know, things that always must happen you know. You know formulas and what not, and experiments."
>
> "It's about advancing science at a tremendous speed, now that we are in the twentieth century."

In Section V he noted "It's just like meeting a

> stranger on the street. You don't know who he is so you're going to fear him maybe a little bit more than if you got a chance to talk to him or what not."

Speculative statements by subject 118 included comments

> like "It's true you know. Something may seem to be beautiful and may actually be dangerous."

The LHL subject (064) produced some inferential statements too. In Section III he observed "And this guy" (referring to the author) "as far as I can understand is a scientist." Later in section IV he noted, "Like if you understand what a song is about or what the painting is about or what the poem is about then you're going to appreciate it more. Like if you go to a science exhibit just for the heck of it to see what it's all about you don't understand what's there or how something works, you're not going to like it or appreciate it or try to understand it."

It will be recalled that the proficient planner produced no erroneous responses. Some examples of erroneous statements by the LHL (064) subject included

Section I "It told how many, many years ago people didn't know much about anything."

Section III, "It tells how in high schools that the high school teachers would try to discourage students from taking science."

The less proficient planner produced no speculative responses. After reading this selection, the LHL subject (064) commented, "I liked it. I liked it better than the Catbird Seat." (This was the SRIR (N) passage.) The HLH subject (118) observed "Well science is necessary but the passage didn't really appeal to me."

Silent Reading Sentence Recall

The HLH subject (118) generated 144 analyzable units on the SRSR (N) passage. It should be noted that this subject's tape contained some noise so not all units could be transcribed. He produced four inferential responses. Examples included comments like, "It shows that it was the only house lit on that street--like it was a two storey brick house."

"The houses like that all look the same--all the little stones in such order."

Referring to the narrator's comments near the beginning subject 118 noted, "You know all the hassles of waiting for a flight and all that stuff."

The LHL (064) subject generated 154 text specific responses. There were three inferential statements. Examples included, "She stared at her husband probably expecting him to go back and say something to the guy."

"The man with his mouth hung open turned to his buddy as if to say, 'What should I do now?'"

The HLH (118) subject produced three erroneous responses. The LHL (064) subject generated four. Since these erroneous responses related to minor details in the story they will not be noted here. It is perhaps significant that the less proficient planner, when commenting on the story, referred to the passage material using the pronoun me. This story was written in the firt person so this stance was understandable. The HLH (118) subject always distanced himself from the passage stating, "The person telling the story" or "The narrator says" and then proceeded to make his point.

Both subjects produced one speculative statement. The proficient planner speculated, "The first sentence just explains the setting."

The LHL (064) subject noted, "Some people are just pretty ignorant."

After reading the selection the HLH subject (118) noted

"It was boring, I don't know, it was really boring, I don't know where the point was except maybe tht people were judging you before they thought of the reason why. He had to make a phone call there so bad. I mean, people were saying he was selfish, but if they took time, thought and understood why this guy might have done this, you know, it was actually them who were being selfish, because apparently the way I look at it, you know, this guy broke off with his wife. She divorced him or something like that and he had to get a hold of them quickly. And I imagine if they knew that reason they wouldn't feel so bad about it. But you know they probably didn't really think about why he did this and it had more than likely been important, and they should have accepted it instead of getting really ignorant about it and talking about it behind his back and not saying anything to him when he got there."

The less proficient planner commented "It was better than some of the ones that I had to read."

On the SRSR (E) passage the HLH student (118) generated 46 analyzable units while the LHL subject (064) produced 48. It should be noted, however, that there was some noisy tape which interfered with the HLH subject's transcription. Both subjects generated several Text Specific responses. HLH (42) LHL (38) Both students also produced one inferential statement. The HLH subject noted, regarding the pupa stage of the fly "It is a bridge between the larva and the adult fly--basically sort of like adolescence."

The LHL (064) subject noted "Flies are found almost everywhere."

The proficient planner produced only two erroneous responses; the less proficient planner produced nine. Examples of erroneous responses included: HLH (118) "And overall in the world there are 82,000."

LHL (064) and the second set (referring to wings) are club shaped and are called helthfers."

There was one speculative statement by the HLH subject. He noted "And there are some other flies here that I never heard of before."

The less proficient planner offered no speculative comments.

On the SRIR (P) passage subjects varied considerably with regard to the types of responses produced. The proficient planner generated 51 text specific responses; the less proficient planner 39.

There were two inferential statements by the HLH subject (118) and none by the LHL subject (064). Regarding sex and pleasure the proficient planner noted "It would be humdrum--more like a job than play so to speak."

Later regarding the discussion of the Roman excesses at Pompeii HLH subject (118) noted "They say that since humans can't eat that much, they go to a place to regurgitate, which is a place where they vomit and there's the name vomitorium. You go and spit up; then eat again."

The proficient planner produced two erroneous responses while the less proficient planner produced 12. Examples included: HLH (118) "I'm not sure what this means. Maybe people have a way of misusing things."

LHL (064) "It says when we frustrate the parts of our body, this is wrong." "It says you can't cooperate with God." "But that can't be tied in with the feelings evocated by creative faculties." Clearly this subject was becoming confused.

The proficient planner produced a number of speculative responses and became quite emphatic when he noted "You're damn right man should be treated well for it." Here the subject (118) is referring to procreation.

"Yeah! Okay, that was a comma. Okay. I understand now."

"The next sentence I need a dictionary--25 foot words."

The LHL subject's (064) only speculative statement was the observation, "They had it pretty easy I guess."

After reading the SRIR (P) selection, the proficient planner ruminated: "I don't like it. I hate it. It just goes to prove, it just shows that, I am note sure what it shows. I know what the point is I agree with it the point about the fact that everything has its purpose. Sure everything has its purpose but I mean having sex and not wanting to have a kid are two different things. I don't think you're misusing it or being sinful. Why take the risk and have a kid when it's not going to grow up in the right environment and get treated wrong and what not. Sure they even say don't have sex at all. That's easy for them to say. But I mean that's one of the main purposes of life. Sure to reproduce, but you know, God probably knew this was going to happen, you know, I mean, if that was case He didn't have to put in the drive."

The LHL (064) subject observed, "I didn't really understand--the words were hard. Basically I understood the basics."

This concluded the microscopic look at the selected HLH and LHL subjects.

In the following section, some comments made by other HLH and LHL subjects after reading the passages will be given.

On completion of the SRUR (N) selection the proficient planner 115 observed: "I like stories like that. At the beginning, it was kinda mixed up because it was telling about this road, about it was saying about this highway you take this route off, they must have been explaining to Mr. Woods or somebody how to get out of that town. Cause maybe they didn't know how to get out of it, and they were planning their bank robbery then. But it was kinda mixed up at the beginning, the first two pages. Then I started to understand it. This Mr. Woods he was probably a bank robber, and nobody knew it. Everybody thought he was a goody-goody. I liked it."

At the end of the SRIR (E) selection, subject 115 noted "I agree with what the author said because there is violence, a lot of violence now, and people just don't care. They just go out and kill somebody, but for all the violence in the world, there's always something there to take its place, like better things."

HLH (068) subject commented after reading the SRIR (N) passage, "The only thing he accomplished was getting her fired so, I guess that was perhaps what he wanted to do. He sounded like he was going to drastic measures for a while, to get rid of her and everything and I guess that was probably what he had planned to get her fired. So I guess it worked out the way he wanted it too."

LHL (032) after reading the SRUR (N) passage commented, "Well it was interesting in some parts, but then sometimes it got really dull where they explained everything right out in detail."

After reading the SRSR (P) selection, this subject observed "It was different. I wasn't expecting what was there but it was also educational. It was I don't know. I can't really describe it."

A similar comment was made by the subject on completing the SRSR (E) selection, "Well it was--I can't really explain it. It is something everybody should know about flies."

Finally this same subject (LHL - 032) concluded after reading the SRCR (P) passage, "That was a real good story, and it was, uh, that was more of a learning experience than any of them, cause that's more about the world around you and the people that you're going to meet not to just harshly judge somebody but to judge 'em fairly."

The LHL (060) participant after reading the SRSR (N) selection observed, "It was pretty good. It didn't turn out like you expected." and after completing the SRUR (E) passage she commented, "It was all right."

This was essentially 060's comments after reading all of the passages. The remarks of these subjects after reading various selections were noted here to indicate the qualitative as well as the quantitative differences in response type.

The remaining phase II subjects, one male and one female, were both in the high planning group. Male subject 016 was a high planner but low on the successive and simultaneous tasks (HLL). Female subject (082) was a high planner and high on the successive marker task, but low on the simultaneous measure (HHL). Neither subject read all the passages. Their biographical profiles are presented in Figure 5.3.

FIGURE 5.3

Biographical Profiles of One HLL and One HHL Subject

HLL 016	Age 20. Completed grade XII (general). Enrolled in a one year Radio and Television Broadcasting program at a Vocational School. Favorite subjects are English, History, and Modern World Problems.
HHL 082	Age 19. Completed grade XII (academic). No particular favorite subject. Enrolled at Business School taking an eleven month medical secretary course.

Both subjects had read the SRUR (N) and (P) passages as well as the SRSR (N) passages.

Table 5.14 shows the total analyzable units produced by these subjects.

A glance at Table 5.14 shows a prolific output by subject 016 (HLL) compared to subject 082 (HHL). However, not much can be gleaned from this comparison because of the uncooperative nature of the HHL subjects. A case in point is her unaided recall of the SRUR (N) passage. The entire protocol is reproduced here.

TABLE 5.14

Analyzable Units Produced on the
SRUR (N) (P) and SRSR (N) Passages
By One HLL Subject and One HHL Subject

Subject Number	Information Integration Group	Reading Task	Passage Type	Complete 't' Units	Inc. 't' Units	Total
016	HLL	SRUR	N	123	8	131
		SRUR	P	17	3	20
		SRSR	N	159	11	170
082	HHL	SRUR	N	12	1	13
		SRUR	P	4	0	4
		SRSR	N	173	3	176

Subject (082) "Well it was about---oh I hate to do this."

Interviewer "Just go ahead please."

Subject (082) "A guy named Stanley Woods came into Leaman town." "I can't do this. Do I have to do this?"
Interviewer: "I'd appreciate it."

Subject (082): "There was a robbery. And there were three cars outside and one of them was a Buick. I can't do it."

Interviewer: "Please try to continue."

Subject (082): "Pinky D at the end there. He was smart. He was very smart. He was six feet tall. He was the one who came by to see who did the robbery. Mr. Stanley Woods was known as somebody else. His real name wasn't Stanley Woods. And the Buick was from Chapel Hill. I don't know anymore."

Interviewer: "What did you think of that story?"

Subject (082): "It was o.k. I think that's a lot of it. I really didn't like it, that's why I can't remember a lot of it."

Not surprisingly this subject didn't come to all the testing sessions when the individualized reading tasks were being administered. The protocol of the SRUR (P) passage from subject 082 follows a similar pattern. That left the SRSR (N) selection, on which both subjects had complete protocols, as the only reasonable parameter of comparison. An in-depth analysis of these protocols follows.

The HHL subject generated 176 analyzable units on the selection; the HLL subject produced 170. Of these, the HHL subject produced 117 text specific responses, while the HLL subject generated 115.

The HHL subject produced four inferential statements, the HLL subject 31. Examples follow: HLL: "She was watching out for their safety" referring to the stewardess. "He really didn't care if he had gotten it or not." (referring to catching a taxi).

HLL "It seems to be some suburban area where all the houses are the same and everything." "Seems where he's faced so much death and everything he's lost all his emotions." "This (referring to the sentence above) probably explains what he says there in the first sentence or the second one. "He seems to be a bit irritable. Hell I guess that's caused by the plane being an hour late." "It seems like his wife is the boss around the house." "And it seems like the storyteller here doesn't seem to be a smoker the way it's bothering him."

Erroneous responses varied considerably between subjects. The HHL subject produced 34, the HLL subject only one. Examples of erroneous responses included HHL "He was tired from the party" (this is clearly a misreading of the information). "The mistress looked at me with an evil eye." "He went to make a telephone call. He coughed to get my attention." "The man with the deep voice, he put out his cigarette and then lit another one." "Before the fat man got in the driver looked him up and down."

HLL "They thought it was kind of funny after, because he came barging in and changed his mind letting them use the phone." (this didn't actually happen).

Perhaps the biggest difference between the two protocols being discussed here involves the number of speculative statements. The HHL subject produced two. The HLL subject generated 23. Indeed he was an avid speculator. Some examples follow:

> "It seems like it was, whoever wrote it, likes to describe things and they ~~go~~ really into detail."

> "This is going to be a very anxious part here according to this next sentence." (The subject here is referring to the part of the story where the fat man comes out of the airport to take his place in the limousine with the other passengers).

> "The author again goes into a fair amount of detail here."

In analyzing these protocols it was observed that the HLL subject produced more inferential and speculative responses than his HHL counterpart. He also produced fewer erroneous responses. This was so, even though the HLL subject was low in both simultaneous and successive processing ability. It appears, although this is a very limited sample, that if planning is high and the coding processes are low reading comprehension is not affected. On the other hand, high successive processing ability combined with planning proficiency seems to make no significant contribution to reading comprehension.

Summary

From the analyses presented in this chapter some major points can be noted regarding planning and reading. They are summarized in Figure 5.4.

From what is known of the fluent reading act, it becomes apparent that many of the characteristics of a good reader are exhibited by the proficient planner. The ability to hypothesize, relate information, and make judgments is crucial. Moreover, the ability to generate a plan and then modify it according to the incoming information is critical. The proficient planner appears to have the flexibility to do this whereas the less proficient planner seems to be more serially bound to the print.

FIGURE 5.4

Qualitative and Quantitative Differences Observed in Recall Data by Proficient and Less Proficient Planners in This Study

	Proficient Planners	Less Proficient Planners
1.	More analyzable units	Fewer analyzable units
2.	More inferential statements	Fewer inferential statements
3.	More speculative statements	Fewer speculative statements
4.	Questioned and evaluated material	Did not question or evaluate material
5.	Related material to experiential background	Rarely related material to experiential background
6.	Generated more hypotheses on SRIR material	Generated fewer hypotheses on SRIR material
7.	Likely to modify hypotheses	Likely to "stick to a hunch" or guess
8.	Compared passages read	Did not compare passages read
9.	Made comments related to literary style	Did not comment on literary style
10.	Displayed insight and a critical eye	Not as likely to read critically
11.	Assertive ("I don't want to read that")	Passive acceptance of material
12.	Rarely exhibited frustration	Exhibited frustration frequently
13.	Few problems decoding	Several decoding problems
14.	Tended to be reflective	Tended to be impulsive
15.	Misreadings were rare	Misreadings were frequent
16.	Erroneous responses remained constant over passage types	Erroneous responses increased from (N) to (E) to (P)
17.	Proficient planners seemed to achieve more school and career success based on biographical profiles	Less proficient planners seemed to have Less school and career success based on biographical profiles

CHAPTER 6

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

The central focus of the present research was to explore the planning component of the Information Integration Model (Das, Kirby & Jarman, 1979) in relation to the reading comprehension of young adults. The performance of 148 subjects on the Visual Search Test, a measure of cognitive planning, was exmained in relation to reading proficiency as defined by a standardized measure of reading achievement, the Cooperative Reading Test, and by performance on reading tasks designed by the researcher to assess the reading processes of individuals.

The study was carried out in two phases. Phase I, conducted in 1980, involved administering marker tests of information integration, IQ, cognitive style, and reading achievement to all 148 grade IX subjects in a rural junior high school in Nova Scotia. Eight subjects were later eliminated from the statistical analyses because they had incomplete data files. Fifteen proficient and 15 less proficient planners were identified by virtue of their performance on the Visual Search Test, a measure of cognitive planning, and were asked to participate in the phase II research conducted four years later.

During 1982 a pilot test was conducted to examine the appropriateness of researcher selected passages and researcher designed reading tasks to be used in phase II of the study. Pilot testing resulted in the selection of nine passages which could be broadly classified under the headings of 1) Narration (N), 2) Exposition (E), and 3) Persuasion (P). Three types of tasks were also selected for use with the phase II subjects. These included 1) Silent Reading Uninterrupted Recall (SRUR), 2) Silent Reading Interrupted Recall (SRIR), and 3) Silent Reading Sentence Retrospection (SRSR).

In 1984, an attempt was made to contact the 15 most proficient and 15 least proficient planners as defined in the phase I research. Thirteen of the proficient planners and seven of the less proficient planners agreed to participate in phase II of the study. They were then administered selected marker tests of information integration to check the stability of these measures over time. The Visual Search test was not administered at this time because it required the use of a specialized piece of equipment which was not available. Subjects were then administered the researcher selected passages and researcher designed tasks which had been previously pilot tested. The protocol material collected during these sessions was audio tape recorded and transcribed into written form. These protocols were subjected to qualitative analysis using a procedure originated by Drum and Lantoff (1977a, 1977b), modified by Fagan (1985), and changed slightly by the investigator. Where possible, statistical procedures were used to test the hypotheses generated in Chapter 1.

Findings and Conclusions

The findings and conclusions presented in this section have been drawn from both phases of the study. The phase I findings will be discussed first followed by the phase II results. The findings from both the quantitative and qualitative parts of the study will be related to the research questions and hypotheses posed in Chapter 1.

Analyses of Data Generated in Phase I

A three way ANOVA was used to test hypotheses 1.1, 2.1, and 3.1.

Question 1. Are there differences on the scores of the marker tests for planning, successive synthesis and simultaneous synthesis, which affect vocabulary as measured by the *Cooperative Reading Test* (CRT)?

H.1. There are no significant main effects or interactions due to planning, successive synthesis and simultaneous synthesis and vocabulary as defined by the CRT?

A three way analysis of variance was computed to answer this question. Subjects were divided by performing a median split on the planning, successive, and simultaneous marker test scores. The three way ANOVA was run with vocabulary as the dependent variable. Results of the analysis indicated significant main effects for simultaneous and successive synthesis in relation to vocabulary and a significant interaction between the two. There were no other significant two way or three way interactions.

From these findings it was concluded that successive and simultaneous syntheses are related to vocabulary performance. Consequently H.1 was rejected.

Question 2. Are there differences on the scores of the marker tests for planning, successive synthesis, and simultaneous synthesis which affect speed of comprehension.

H.2.1 There are no significant main effects or interactions due to planning, successive synthesis, and simultaneous synthesis and speed of comprehension as measured by the CRT.

Results of the ANOVA indicated a significant main effect for successive synthesis in relation to speed of comprehension. There were no significant two way or three way interactions. It was concluded that successive synthesis is related to speed of comprehension. As a result H2.1 was rejected.

Question 3. Are there differences on the scores of the marker tests for planning, successive synthesis and simultaneous synthesis which affect level of comprehension?

H3.1 There are no significant main effects or interactions due to planning, successive synthesis and simultaneous synthesis and level of comprehension.

Results of this analysis indicated a significant main effect for both planning and simultaneous synthesis in relation to level of comprehension. There were no significant two or three way interactions. As a result of the findings H3.1 was rejected.

Question 4. Are there differences between the eight information integration groups, as defined in the study, in terms of the three dependent variables of vocabulary, speed of comprehension, and level of comprehension?

H4.1 There are no significant differences between the eight information integration groups in terms of the three dependent variables of
.11 vocabulary
.12 speed of comprehension
.13 level of comprehension

To examine this question a median split was performed on the data and all subjects were classified into one of eight information integration groups. These included 1) High Planning, High Successive, High Simultaneous (HHH), 2) High Planning, Low Successive, Low Simultaneous (HLL), 3) High Planning, Low Successive, High Simultaneous (HLH), 4) High Planning, High Successive, Low Simultaneous (HHL), 5) Low Planning, Low Successive, High Simultaneous (LLH), 6) Low Planning, High Successive, High Simultaneous (LHH), 7) Low Planning, High Successive, Low Simultaneous (LHL) and 8) Low Planning, Low Successive, Low Simultaneous (LLL).

All subjects were also divided on the measures of vocabulary, speed of comprehension, and level of comprehension by performing a median split on the raw score data produced by the CRT subtests. This procedure was detailed in Chapter 4. By using a system of simple percentages, it then became possible to compare the subjects' performance on the three dependent variables of vocabulary, speed of comprehension, and level of comprehension with information integration group placement. Analysis of the results indicated that the HHH and HHL groups were fairly evenly matched with regard to level of comprehension performance on the CRT. Seventy-nine percent (HHH) and 80 percent (HHL) of the subjects in these groups were above the median on this subtest of the CRT. Level of comprehension, it will be recalled, is the power of comprehension measure on the CRT. Subjects' level of comprehension performance declined from the highs achieved by the HHH and HHL groups previously mentioned to 69% (LHH); 55% (HLL); 47% (HLH); 44% (LLH); 36% (LHL); and 17% (LLL).

There was a steady decline in speed of comprehension across the groups as well. Seventy-four percent of the HHH group subjects were above the median on this subtest of the CRT. Results for the other groups were 70% (HHL); 63% (LHH), 45% (HLL); 33% (HLH); 44% (LLH); 36% (LHL); and 39% (LLL).

Vocabulary performance tended to fluctuate substantially between groups. The LHH group posted the best performance in this regard, with 88 percent of its members above the median. The next highest scores were achieved by the HHH group (59%) followed by the LHL subjects with 50%. The other groups performed in the following manner on the vocabulary measure. HLL (45%), LLH (44%), HHL (40%), and LLL (30%).

The most spectacular difference in scores overall was noted between the HHH group and the LLL group. In light of these findings hypothesis H4.1 was rejected.

Question 5. Are the scores on the two marker tests of simultaneous synthesis, Figure Copying and Memory for Designs stable over time?

H4.1 There are no significant changes in scores on the two marker tests of simultaneous synthesis, Figure Copying and Memory for Designs over time.

To test this hypothesis correlations were computed between the selected subjects' 1980 scores and the scores achieved during the 1984 testing. Levels of significance reported are at the .05 level in all cases although in light of N they may not be meaningful. The correlation between the two sets of Memory for Design scores was $.2510 < .5760$ ($N = 12$). The correlation between the two sets of Figure Copying scores was $.6575 > .6319$ ($N = 10$). The results of this analysis indicated that the Figure Copying measure was stable over time but the Memory for Designs task was not. As a result hypothesis H4.1 was partially rejected.

Question 6. Are the scores on the two marker tests of successive synthesis Digit Span and Auditory Serial Recall stable over time?

H6.1 There are no significant changes in scores on the two marker tests of successive synthesis, Digit Span and Auditory Serial Recall over time.

This hypothesis was also tested by computing the correlation between the 1980 and 1984 scores. The correlation between the two sets of Digit Span scores was $4962 > .4555$ ($N = 19$). That between the two sets of

Auditory Serial Recall scores was .4528 > .4438 (N = 20). As a result H6.1 was accepted.

Question 7. What is the relationship between the performance of subjects on specially designed reading tasks and their information integration capabilities established three years earlier?

In order to examine this question, researcher designed reading tasks were adminsitered to subjects. Data was collected using the technique of analytical introspection/ retrospection and all responses were audio taped and later transcribed into typed protocols.

These protocols were subjected to qualitative as well as quantitative analyses. Since planning in relation to reading was the focus of this study, subjects with high and low scores on the Visual Search test were selected for analysis. This meant that the two coding processes were not controlled. As a result,not all information integration groups were represented. There were, however, subjects representing six of the eight groups. These included HHH, HLH, LHL, HLL, and HHL.

The last two designations (HLL and HHL) were represented by only one subject. Moreover, the HHL subject was somewhat uncooperative which meant that the quality of the protocol material was poor. The major comparison of phase II subjects was carried out between the HHH and LLL subjects--already determined as the most divergent groups--and the HLH and LHL groups because these subjects represented mirror images of each other.

Analysis of the protocols for these groups indicated very clearly that the HHH and HLH subjects performed in a manner far superior to their LLL and LHL counterparts on the reading tasks. Notable differences included more prolific 't' unit output for the proficient planners and more willingness to generate hypotheses. The less proficient planners exhibited an unwillingness to hypothesize and produced fewer 't' units. They also generated more erroneous responses.

These findings confirmed that the relationship between information integration and reading ability is of considerable magnitude. More specifically, subjects who are good cognitive planners appear to be better readers. In addition, strengths in the two coding processes (successive and simultaneous) appears to be positively related to reading performance. These relationships are also stable over time.

Question 8. Are there patterns of performance relative to qualitative analyses of the reading tasks and information integration?

In depth analysis of the protocols of subjects participating in the phase II research revealed a number of consistent and theoretically predictable reading behaviours. The subjects in the high planning group exhibited many traits of the fluent reader, one of which was the ability to think critically about what was being read. It will be recalled that both subjects who refused to cooperate on passages were from high planning groups. Moreover, proficient planners produced many inferential and speculative statements and often related the material to their experiential background. This frequently included references to previous schooling. Proficient planners had little difficulty generating hypotheses and could predict from the title, accurately what a passage was going to be about. If the nature of the incoming information changed, they would modify their hypotheses. This flexibility, or willingness to shift gears, was one of the most salient features of their protocol responses. Many of these subjects often displayed a willingness to talk, at length, about what they had read after the completion of a task. Finally, the proficient planners recognized changes in passage format. For instance they recognized that the (E) passages were informational and referred to them as articles. They recognized SRUR (N) and SRIR (N) passages as short stories. Sometimes they would compare the passages read to articles or stories they had read in school. They also tended to compare passages administered during the testing sessions, the SRUR (N) to SRIR (N) for example.

Subjects in the low planning groups presented a very different picture from that just described. During the testing they never verbally questioned an author's stance or point of view. All reading material presented to them was received in a passive but accomodating manner. A notable characteristic of their performance was the number of erroneous responses accumulated. Inferential and speculative responses were at a minimum. The researcher often had to sift through many protocols to find examples of these response types. Material read was seldom related to experiential background or past school experience.

It was difficult to get the less proficient planners to hypothesize. When asked what a title was about, they would often refuse to hypothesize unless prodded into doing so as in the SRIR task. These subjects would also speculate on material only when put into a situation requiring them to do so as in the SRSR task.

The less proficient planners did not seem to be aware of presentation format and when discussing an (E) or (P) passage would often refer to it as a story. They also exhibited problems distancing themselves from the author's point of view and seemed to be a victim of their own egocentrism.

Finally, the errors of the less proficient subjects increased as the passages moved from narration to exposition to persuasion. Less proficient planners had serious problems with the (P) passages in particular. They also had difficulty decoding some of the words in these selections.

In summary, the proficient planners exhibited many of the chaacteristics of fluent readers. The less proficient planners did not.

Question 9. Are there other characteristics revealed which relate to the patterns of information integration and everyday cognitive activity?

Although the phase II subjects represented a very small sample (N = 20), an examination of their biographical profiles presented in Chapter 5 presents some interesting food for thought. Proficient planners, for the most part, tended to continue their education at some level (vocational, technical, university) or else they had solidified some "plans" for the future.

The less proficient group did not fare as well. One applied for admission to university and was refused. A second was laid off from his job. Another had had several jobs. Still another was undecided about a career and had missed so much time at school that she was going to have to repeat.

These patterns of performance related to adjustment to adult life and the world of work were quite striking.

Limitations of the Findings of the Study

In the course of conducting the research, some other limitations have come into effect which the reader should keep in mind when interpreting the results of the study.

1. The sample size in the phase I research was reduced from 148 to 140 because eight subjects had incomplete files of test scores and as a result, they had to be deleted from the statistical analyses.

2. The sample size in phase II was reduced from 30 to 20 because not all of the subjects selected from phase I could be located after three years, and because some

selected phase II subjects did not wish to participate. This resulted in the most divergent groups being represented.

Implications

The following implications have been drawn from the findings presented in this research. These implications relate to reading theory, the teaching of reading, the preparation of materials, the construction of reading tests and the training of teachers.

Reading Theory

Chapter 2 of this dissertation provided a summary of the theoretical background on which it is based. Prevalent in that review was the notion of sampling and predicting (Smith, 1971) and planning and purpose (Stauffer, 1976) in fluent reading. Researchers in a number of fields--artificial intelligence--Schank (1969), neurometrics, Coleman (1976), neurospsychology Luria (1966), and psychology Das, Kirby, and Jarman (1979) have discussed the notion of planful behaviour. Luria has related planful behaviour to brain functioning. To the extent that fluent reading requires critical thinking, a reading theory which explicitily incorporates the notion of planning as one of its foremost and salient features, and which aims to describe the relationship between construction and implementation of plans and reading comprehension is required. Support for such a theory comes as a result of the present study which indicates that subjects high in cognitive planning ability exhibit many of the characteristics of fluent readers, whereas those low in cognitive planning ability exhibit many of the characteristics of functional readers confirming and extending previous research and theory.

Reading Instruction

This study confirmed cognitive planning is related to reading comprehension. As such, teachers need to be aware that poor planning skills may have a severe impact on reading success. At present, more needs to be known about the nature of cognitive planning and its various manifestations. The present research, although clinical in nature, did indicate that some reading activities can heighten the awareness of the reader and make him cognizant of the fact that to hypothesize and speculate are important skills in fluent reading.

In the present study, the SRIR and SRSR tasks appeared to be extremely helpful in achieving this goal. The first task was designed on the basis of research by Stauffer (1976). The second was not dissimilar to glossing, a practice long used with students having difficulty getting meaning from print. Since awareness is the first step in remediation, classroom teachers should provide opportunities for children to expand their ability to construct plans and follow them through. Activities such as outlining and arranging disynchronous paragraphs into an order which "makes sense" not only provide valuable practice in constructing plans but will help students heighten their sequential skills as well.

Perhaps most important of all, teachers should recognize that planful behaviour is the key to all organized and productive activity and, as such, they should on a daily basis, focus attention on organizational skills not only in reading but in all classroom activity.

The analysis of the protocols in this study showed a number of qualitative differences between the output of proficient and less proficient planners. In particular it revealed that less proficient planners had difficulty with passages of an informational type (not unlike material in many textbooks in the content areas) and passages of the persuasive type (passages which require critical thinking skills to separate fact from opinion and truth from falsity). Individuals and commercial enterprises involved in reading material preparation at all educational levels should endeavour to participate in the kind of diligent research which will provide additional insights into the relationship between cognitive planning and how this impacts on the construction of reading materials. By so doing, a major problem of poor readers may be alleviated.

Reading Test Construction

Many educators use standardized tests to measure reading ability. Because standardized reading tests are used over all ages and grades and are employed extensively to place subjects in reading levels and achievement groups, an attempt must be made to design reading measures which contain as a component, an assessment of the process of reading. One variable that could be examined in this regard is cognitive planning. As research in this area is only developing, time and money must be invested to investigate, in greater depth, this important variable which has been shown to affect reading behaviour.

By building a planning component into assessment materials, some prospective difficulties may be able to be remediated before they seriously develop later on in the educational life of the student.

Teacher Preparation

Educators at teacher training institutions should be aware of the importance of planning as it relates to reading and subsequently to the teaching of reading. All aspects of planful behaviour--hypothesis testing, reflectivity, selection of relevant information, flexibility and decision making--should be emphasized. Individuals who assess teachers in the classroom should be cognizant of the value of instructing students in planful behaviour and should endeavour to construct and design experiences which heighten these skills in their teacher trainees.

Suggestions for Future Research

The findings of both phases of the current study indicate that cognitive planning is related to reading comprehension. To the author's knowledge this is the first study of this kind. Since a relationship has been established, more investigations are required to focus on the intricacies of this relationship.

One possible approach could be to match subjects according to their cognitive coding abilities (successive and simultnaoues processing) so that the impact of planning on reading could be observed more clearly.

Planning at present, is a blanket term used to describe a number of different types of behaviours. There is, of course, a well established link between the generation and acting out of plans and higher cortical functioning (Luria, 1966). Studies are required which examine the nature of planning in a more microscopic way. By so doing, it might become apparent that only specific types of cognitive planning relate to reading related activities.

More testing instruments have to be developed to measure cognitive planning using different sensory modes. For example, since both Vygotsky (1934) and Luria (1966) discuss the importance of speech in regulating and monitoring behaviour, instruments which utilize speech as a mode for assessing planning should be developed. Verbal mediation was a factor inherent in the reading tasks employed in this study. Perhaps such tasks can be refined and modified to contribute to the effective integration of reading as a task of planful behaviour.

Finally, this research indicated some very interesting patterns of behaviour in relation to the educational plans and the career choices of the individuals chosen for phase II of the research. As such, the lab marker tests employed by Das, Kirby and Jarman (1979) to assess planinng have been given a degree of ecological validity. Longitudinal studies that assess subjects' cognitive planning abilities and follow them through time are required to see if the group of subjects used in the study was a typical or atypical group.

Further research which places the emphasis on the organizational aspects of reading is required. A number of researchers Rumelhart (1981) and Stauffer (1976) have noted the importance of intention, purpose, and planning in the fluent reading act. The present study confirms that this area of research in reading should be pursued.

Finally the present study calls for more vigorous research in the area of cognitive planning and reading comprehension to uncover the complex fabric of what specifically constitutes planning and how it can be utilized and incorporated into the construction of reading tests, the design of materials and the teaching of generations of readers. The human system is complex and is comprised of a number of systems which are constantly interacting together. The affect of planning on the interacting of these systems, as well as the identificaiton of different types of planful behaviour and how these might imapct on specific activities are all questions which need to be answered by future research. It is hoped that as a result of the findings of this study which have related cognitive planning to reading comprehension, research in this area will be vigorously pursued.

Concluding Statement

This study attempted to meld two research paradigms--the empirical and the naturalistic. Using both these avenues, it has confirmed and extended the previous research which showed the relationships between integrative/cognitive and particularly, planning strategies and reading achievement. Since the nature of this study is exploratory it has generated many additional hypotheses which remain to be substantiated in the future.

BIBLIOGRAPHY

BIBLIOGRAPHY

Abelson, R. Concepts for Representing Mundane Reality in Plans. In D. Bobrow and A. Collins (Eds.), Representation and Understanding: Studies in Cognitive Science. New York: Academic Press, 1975.

Abelson, R. The structure of belief systems. In R. Schank and K. Colby (Eds.), Computer models of Thought and Language. San Francisco: Freeman, 1973.

Adler, M. How to read a book. New York: Simon & Schuster, 1940.

Armitage, S.F. An analysis of certain psychological traits used for the evaluation of brain damage. Psychological Monographs, 1946, 60 (Whole No. 277).

Ashman, A. The relationship between planning and simultaneous and successive synthesis. Unpublished doctoral dissertation, Department of Educational Psychology, University of Alberta, 1978.

Audley, R.J. What makes up a mind? In F.G. Castles, D.J. Murray, and D.C. Potter (Eds.), Decisions, organizations and society. Hardmondsworth, England: Penguin Books Ltd., 1971.

Bacon, F. Essays. New York: Charles Scribner's Sons, 1928.

Bakker, D.J. Temporal order in disturbed reading. Rotterdam, Netherlands: Rotterdam University Press, 1972.

Bartlett, F.C. Remembering--an experimental and social psychology. Cambridge, England: The University Press, 1932.

Bartlett, F.C. Thinking. London: Allen and Unwin, 1958.

Beebe, M.J., Fagan, W.T., & Malicky, G.V. Discourse processing operations and reading. Unpublished paper, University of Alberta, 1981.

Biemiller, A. The development of the use of graphic and contextual information as children learn to read. Reading Research Quarterly, 1970-71, 6, 75-96.

Brake, M.D. *An investigation of oral and silent reading with low and high achievers*. Unpublished master's thesis, University of Alberta, 1981.

Blank, M., Weider, R., & Bridger, A. Verbal deficiencies in abstract thinking in early reading retardation. *American Journal of Orthopsychiatry*, 1968, *38*, 823-834.

Brown, A.L. The development of memory: Knowing, knowing about knowing and knowing how to know. In H.W. Reese (Ed), *Advances in child development and behavior*. *Volume 10*, New York: Academic Press, 1975.

Brown, A. Development, schooling and the acquisition of knowledge about knowledge. In R.C. Anderson, R. Spiro, and W. Montague (Eds.), *Schooling and the acquisition of knowledge*. Hillsdale, N.J.: Erlbaum Assoc., 1977(a).

Brown, A. *Knowing when where and how to remember: A problem of metacognition*. (Technical report no. 47). Urbana, Illinois: Illinois University, Center for the Study of Reading, June 1977(b).

Brown, A. *Theories of memory and the problem of development: Activity, growth, and knowledge* (Technical report no. 51). Urbana: Illinois University, Center for the Study of Reading, July 1977(c).

Brown, A. & Deloache, J. Skills, plans, self regulation. (Technical report no. 48). Washington, D.C.: National Institute of Education (DHEW), 1977.

Brown, E. The bases of reading acquisition. *Reading Research Quarterly*, 1970, *6*(1), 49-74.

Bruce, B.C. Plans and social actions. Center for the Study of Reading. (Report no. 34). University of Illinois at Urbana-Champaign, 1977.

Bruce, B. & Newman, D. Interacting Plans Center for the Study of Reading. (Report no. 88). University of Illinois at Urbana-Champaign, 1978.

Calfee, R.C. Memory and cognitive skills in reading acquisition. In D.D. Drake and M.B. Rawson (Eds.), *Reading, perception and language*: Papers from the World Congress on dyslexia. Baltimore: York Press, 1974.

Cassel, R.N. *Psychology of decision making*. North Quincy, Mass.: The Christopher Publishing House, 1973.

Clarke, D.C. Unaided Recall of Able and Less Able Readers. Unpublished master's thesis, University of Alberta, 1981.

Cleland, D.L. A construct of comprehension. In J.A. Figurel (Ed.), Reading and inquiry (Proceedings of the 10th annual conference, Vol. 10). Newark, Del.: International Reading Association, 1965.

Cohen, A.S. Oreal reading errors of first greade children taught by a code emphasis approach. Reading Research Quartelry, 1974-75, 10, 616-650.

Coleman, D. A new computer test of the brain. Psychology Today, 1976, 9, 44-48.

Cronin, M. The relationship of story grammar to recall of grade six Cree students. Unpublished master's thesis, University of Alberta, 1980.

Cummins, J., & Das, J.P. Cognitive processing and reading difficulties: A framework for research. Alberta Journal of Research, 1977, 23, 245-256.

Das, J.P. Cultural deprivation and cognitive competence. International Review of Research in Mental Retardation, 1973, 6, 1-53.

Das, J.P. Structure of cognitive abilities: Evidence for simultaneous and successive processing. Journal of Educational Psychology, 1973, 65, 103-108.

Das, J.P. Personal communication, April 6, 1979.

Das, J.P. Cognitive Strategies and Educational Performance. New York: Academic Press, 1984.

Das, J.P., Kirby, J.R., & Jarman, R. Simultaneous and successive cognitive processes. New York: Academic Press, 1979.

Das, J.P., Kirby, J.R., & Jarman, R. Simultaneous and successive synthesis: An alternate model for cognitive abilities. Psychological Bulletin, 1975, 82(1), 87-103.

Dewey, J. How we think. Boston: Heath Publishing Company, 1933.

Dickie, K.E. Effects of compressing visual information and field dependence on acquiring a procedural skill. Dissertation Abstracts International, 1970, 31A, 662.

Dubos, R. So human an animal. New York: Charles Scribner's Sons, 1968.

Drum, P.A. & Lantaff, R.E. Scoring categories for protocols. Paper presented at the Second Annual Language Conference, Boston University, October 1977a.

Drum, P.A. & Lantaff, R.E. Differences by reading ability grade in recall of information. Unpublished paper, University of California, 1977b.

Edfeldt, A.W. Silent speech and silent reading. Chicago: University of Chicago, 1960.

Educational Testing Service. The Cooperative Reading Test Form 2A. Addison-Wesley Publishing Company. Don Mills, Ontario, 1960.

Fagan, W.T. Comprehension categories for protocol analysis. In W.T. Fagan, C. Cooper and J. Jensen (Eds.) Measures for research and evaluation in the English language arts, Volume 2. Urbana, Illinois: National Council of Teachers of English, 1985.

Festinger, L. A theory of cognitive dissonance. Stanford, California: Stanford University Press, 1957.

Festinger, L. Conflict, decision, and dissonance. Stanford, California: Stanford University Press, 1964.

Flavell, J.H. The developmental psychology of Jean Piaget. Princeton, N.J.: Van Nostrand, 1963.

Flavell, J.H. Metacognitive aspects of problem solving. In L.B. Resnick (Ed.), The nature of intelligence. Hillsdale, N.J.: Erlbaum Assoc., 1976.

Flavell, J.H. Metacognitive and cognitive monitoring. A new area of cognitive development inquiry. American Psychologist, 1979, 39(10), 906-911.

Frederickson, C.H. Representing logical and semantic structure of knowledge acquired from discourse. Cognitive Psychology, 1975, 7, 371-458.

Furniss, E.R. Schemes for reading and recall of story narrative and descriptive informational texts: A study of sixth grade proficient readers. Unpublished doctoral dissertation, University of Alberta, 1978.

Gates, A.I. Reading in the elementary school. In Forty-eighth yearbook of the NSEE. Part II. Chicago: University of Chicago Press, 1949.

Gibson, E.J. Perceptual learning and the theory of word perception. Cognitive Psychology, 1971, 2, 351-368.

Goodman, K.S. Reading: A psycholinguistic guessing game. In H. Singer and R.B. Ruddell (Eds.), Theoretical models and processing of reading. Newark, Del.: International Reading Association, 1976.

Graham, F.K., & Kendall, B.S. Memory-for-Designs test: Revised general manual. Perceptual and Motor Skills, 1960, 11, 147-188.

Gray, W.S. Major aspects of reading. In H.M. Robinson (Ed.), Sequential development of reading abilities. (Supplemental Educational Monograph No. 90). Chicago: University of Chicago Press, 1960.

Gray, W.S., & Rogers, B. Maturity in reading; its nature and appraisal. Chicago: University of Chicago Press, 1956.

Grippin, P.C. Field dependence and reflection-impulsivity as mediators of performance on a programmed learning task with and without strong prompts. Dissertation Abstracts International, 1973, 34A, 2387-2388.

Guilford, J.P. Creativity. American Psychologist, 1950, <5>, 444-454.

Guilford, J.P. Creative ability in the arts. Psychological Review, 1957, 64, 110-118.

Guilford, J.P. Traits of creativity. In H.W. Anderson (Ed.), Creativity and its cultivation. New York: Harper and Row, 1959.

Guilford J.P., Berger, R.M., & Christensen, P.R. A factor analytic study of Planning II Administration of Tests and analysis of results. Report of the Psychological Laboratory, No. 12, Los Angeles, University of Southern California, 1955(a).

Guilford, J.P., Frick, J.W., Christensen, P.R., & Merrifield, P.R. A factor analytic study of flexibility in thinking. Report of the Psychological Laboratory, No. 18, Los Angeles, University of Southern California, 1955(b).

Hall, G.S. Educational problems (Vol. 2). New York: Appleton, 1911.

Halle, M., & Stevens, K.N. Analysis by synthesis. In W. Wathen-Dunn & L.E. Woods (Eds.), Preceedings of the seminar on speech compression and processings. Bedford, Mass.: Air Force Cambridge Research Laboratories, 1959.

Hardyck, C.D., & Petronovich, L.F. Subvocal speech and comprehension levels as a function of the difficulty level of reading material. Journal of Verbal Learning and Verbal Behavior, 1970, 9, 647-652.

Head, H. Collected papers on aphasia and kindred affectations. Cambridge: Cambridge University Press, 1926.

Hebb, D.O. The organization of behavior: A neuropsychological theory. New York: John Wiley and Sons, Inc., 1949.

Heemsbergen, D.B. Planning as a Cognitive Process: An empirical investigation. Unpublished doctoral dissertation, University of Alberta, 1980.

Huey, E.B. The psychology and pedagogy of reading. Massachusetts: MIT Press, 1968. Original 1908.

Ilg, F.L., & Ames, L.B. School readiness: Behavior tests used at the Gesell Institute. New York: Harper and Row, 1964.

James, W. Principles of psychology (Vol. II). London: Macmillan, 1890.

Judd, C.H., & Buswell, G.T. Silent reading. Chicago: University of Chicago, 1922.

Kagan, J. The role of evaluation in problem solving. In J. Hellmuth (Ed.), Cognitive studies: Deficits in cognition (Vol. 2). New York: Bruner/Mazel, 1971.

Kaufman, D. The relation of academic performance to strategy training and remedial techniques: An information processing approach. Unpublished Ph.D. dissertation, University of Alberta, 1978.

Kaufman, D. & Kaufman, P. Strategy training and remedial techniques. Journal of Learning Disabilities, 1979, 12, 416-419.

Khodzhava, Z. Role of orientation in process of reading. Proceedings of a Conference on Psychology. Izd. Akad. Ped. Nank. RSFSR: Moscow, 1957.

Kintsch, W., & van Dijk, T. Toward a model of text comprehension and production. Psychological Review, 1978, 85, 364-394.

Kirby, J.R. The development of semantic and syntactic processes involved in early reading. Paper presented at the XXIInd International Congress of Psychology, Leipsig GDR, 1980.

Kirby, J.R., & Das, J.P. Reading achievement, IQ and simultaneous-successive processing. Journal of Educational psychology, 1977, 69, 564-570.

Krywaniuk, L.W. Patterns of cognitive abilities of high and low achieving school children. Unpublished doctoral dissertation, Department of Educational Psychology, University of Alberta, 1974.

Krywaniuk, L.W., & Das, J.P. Cognitive strategies in native children: Analysis and intervention. Alberta Journal of Educational Research, 1976, 22 271-280.

Latham, R.O.M. Cognitive synthesis and the comprehension of written language. Unpublished doctoral dissertation, Department of Elementary Education, University of Alberta, 1973.

Lefevre, C. Linguistics and the teaching of reading. New York: Macmillan, 1964.

Leong, C.K. Spatial-temporal information-processing in children with specific reading disability. Reading Research Quarterly, 1976-77, 12, 204-205.

Leong, C.K. Cognitive patterns of "retarded" and below average readers. Contemporary Educational Psychology, 1980, 5, 101-117.

Levy, B. Reading: Speech and meaning process. Journal of Verbal Learning and Verbal Behavior, 1977, 16, 623-638.

Lewin, K. A dynamic theory of personality. New York: McGraw-Hill, 1935.

Lewin, K. Field theory in social science. In D. Cartwright (Ed.). New York: Harper, 1951.

Lovett, M.W. The selective encoding of sentential information in normal reading development. Child Development, 1979, 50, 897-900.

Luria, A.R. Higher cortical functions in man. (Trans. by Basil Haigh). New York: Basic Books, Inc., 1966.

Luria, A.R. Human brain and psychological processes. (Trans. by Basil Haigh). New York: Harper and Row, 1966.

Luria, A.R. The functional organization of the brain. Scientific American, 222(3), 66-72, 78.

Luria, A.R. The working brain: An introduction to neuropsychology. (Trans. by Basil Haigh). New York: Basic Books, Inc., 1973.

Mackworth, N.H. Originality. American Psychologist, 1965, 20, 51-56.

Mackworth, N.H. The line of sight approach. In S. Wanat (Ed.), Language and reading comprehension. Arlington, Va.: Centre for Applied Linguistics, 1977.

Mandler, J.M., & Johnson, N.S. Rememberance of things parsed: Story structure and recall. Cognitive Psychology, 1977, 9 (1), 111-151.

McGuigan, F.J., & Rodier, W.I. Effects of a simulation on covert oral behavior during silent reading. Journal of Experimental Psychology, 1968, 76, 649-655.

McLeod, R. Inference in reading comprehension. Unpublished doctoral dissertation, Department of Elementary Education, University of Alberta, 1978.

Miller, G.A. The magical number seven plus or minus two: Some limits on our capacity for processing information. Psychological Review, 1956, 63, 81-92.

Miller, N.E. Experimental studies of conflict. In J. McVidunt (Ed.), Personality and the behaviour disorders. New York: Ronald, 1944.

Milner, B. Some effects of frontal lobectomy in man. In J.M. Warren, and K. Akert (Eds.), The frontal granular cortex and behaviour: A symposium. New York: McGraw-Hill, 1964.

Monod, J. Chance and necessity (Trans. by A. Wainhouse). New York: Alfred A. Knopf, 1971.

Morris, W.T. Matching decision aids with intuitive styles. In H.S. Brinkers (Ed.), Decision making: Creativity, judgment, and systems. Columbus, Ohio: Ohio State University Press, 1972.

Neisser, U. Cognition and reality. San Francisco: W.H. Freeman, 1976.

Neisser, U.C. Cognitive psychology. New York: Appleton-Century-Crofts, 1967.

Neisser, U. Seminar on cognitive skills. Department of Psychology, Stanford University, 1974.

Nelson, B.A. Effects of the analytical-global and reflectivity-impulsivity cognitive styles on the acquisition of geometry concepts presented through emphasis or no emphasis and discovery or expository lessons. Dissertation Abstracts International, 1973, 33A, 4949.

Norman, D.A. & Rumelhart, D.E. and the LNR Research Group. Exploration in Cognition. San Francisco: Freeman, 1975.

Ohnmacht, F.W. Effects of field independence and dogmatism on reversal and nonreversal shifts in concept formation. Perceptual and Motor Skills, 1966, 22, 491-497.

Pearson, P.D. Some practical applications of a psycholinguistic model of reading. In S.J. Samuel (Ed.), What research has to say about reading instruction. Newark, Del.: International Reading Association Inc., 1978.

Peel, E.H. The pupil's thinking. London: Oldborne Book Co. Ltd., 1961.

Piaget, Jean. The child's conception of the world. London: Paul Trench, Trubner & Co. Ltd., New York: Harcourt Brace & Co., 1929.

Pribram, K.H. The languages of the brain. Englewood Cliffs, N.J.: Prentice-Hall, 1971.

Pribram, K.H. The primate frontal cortex. In K.H. Pribram and A.R. Luria (Eds.), Psychophysiology of the frontal lobes. New York: Academic Press, 1973.

Ramey, G.W., & Mitchell, C.A. Comprehending the comprehender. Unpublished manuscript, May 1978.

Randhawa, B.S. & Hunt, D. Some further evidence on successive and simultaneous integration and individual differences. Canadian Journal of Behavioural Science, 1979, 11, 340-355.

Raven, J.C. Progressive Matrices. Sel A B C D E (Revised order 1956), W.K. Lewis and Company Ltd., London, 1956.

Reitan, R.M. The relation of the Trail-making test to organic brain damage. Journal of Consulting Psychology, 1955, 19, 393-394.

Restak, R. Brain potentials: Signaling our inner thoughts. Psychology Today, 1979, 12, 42-54.

Restak, R. The brain: The last frontier. New York: Doubleday & Co., 1979.

Richards, I. Practical criticism: A study of literary judgement. New York: Harcourt, Brace and World, Inc., 1929.

Robinson, A.M. The major aspects of reading. In H.A. Robinson (Ed.), Reading: Seventy-five years of progress. Proceedings of the annual conference on reading held at the University of Chicago, 1966, Vol. 28, 22-32. (Supplementary Educational Monographs). Chicago: University of Chicago Press.

Rumelhart, D. Notes on schema for stories. In D. Bobrow & A. Collins (Eds.), Representation and Understanding: Studies in Cognitive Science, New York: Academic Press, 1975.

Rumelhart, D.E. Schemata: The Building Blocks of Cognition in J.T. Guthrie (Ed.), Newark, Del.: IRA, 1981.

Rumelhart, D.E. & Ortony, A. The representation of knowledge in memory. In R.C. Anderson, J.R. Spiro and W.E. Montague (Eds.), Schooling and the Acquisition of knowledge. Hillsdale, N.J.: Erlbaum, 1977.

Ryckman, D.B. Reading achievement, IQ, and simultaneous-successive processing among normal and learning-disabled children. Alberta Journal of Educational Research, 1981, 27, 74-83.

Schank, R. A conceptual dependency representation for a computer oriented semantics. Stanford University, 1969. Technical Report C.S. 130. Stanford Artificial Intelligence Project, Memo AI-83.

Schank, R. Conceptual dependency: A Theory of natural language understanding. Cognitive Psychology, 1972, 3, 552-631.

Schank, R. Identification of Conceptualizations underlying natural language. In R. Schank and K. Colby (Eds.), Computer Models of Thought and Language. San Francisco: Freeman, 1973.

Schank, R. & Abelson, R. Scripts, plans, goals and understanding. Hillsdale, N.J.: L. Erlbaum, 1977.

Sechenov, I.M. Elements of thought. In W. Dennis, P.A. Kolers, and S.H. White (Eds.), Classics in psychology: I.M. Sechenov--Bibliographical sketch and essays. New York: Arno Press, (1878), reprinted 1973.

Shagrass, C. Evoked brain potentials in psychiatry. New York: Plenum Press, 1972.

Shannon, C. & Weaver, W. The mathematical theory of communication. Urbana, Illinois: University of Illinois Press, 1949.

Smith, F. Understanding reading. New York: Holt, Rinehart and Winston, 1971.

Spreen, O., & Geddes, W.H. Developmental norms for 15 neurospychological tests age 5 to 15. Cortex, 1969, 171-191.

Stauffer, R.G. The dimensions of sound reading instruction. In R.G. Stauffer (Ed.), Action research in LEA instructional procedures. Newark, Del.: University of Delaware, 1976.

Stauffer, R.G. The role of intention in reading and thinking. In S. Wanat (Ed.), Language and reading comprehension. Arlington, Va.: Centre for Applied Linguistics, 1977.

Teuber, H.L. The Riddle of the frontal lobe function in man. In J.M. Warren and K. Akert (Eds.), The Frontal Granular Cortex and Behaviour. New York: McGraw-Hill Book Co., 1964, 410-444.

Teuber, H.L., Battersby, W.S., & Bender, M.B. Changes in visual searching performance following cerebral lesions. American Journal of Psychology, 1949, 159, 592.

Thorndike, E.L. Reading as reasoning: A study of mistakes in paragraph reading. Journal of Educational Psychology, 1917, 8, 323-332.

Tierney, R.J., Bridge, C., & Cera, M.J. The discourse processing operations of children. Reading Research Quarterly, 1979, 14(4), 539-573.

Vygotsky, L.S. Thought and language. Cambridge, Mass.: MIT Press, 1962 (original edition, Moscow, 1934).

Wanat, S. Developmental psycholinguistics: Implications for reading research. In S. Wanat (Ed.), Language and comprehension. Arlington, Va.: Centre for Applied Linguistics, 1977.

Weber, R.M. First graders' use of grammatical context in reading. In H. Levin and J.P. Williams (Eds.), Basic Studies on Reading. New York: Basic Books, 1970.

Weschler, D. Weschler Intelligence Scale for Children - Revised. New York: Psychological Corporation, 1974.

Wertheimer, M. Productive thinking. New York: Harper, 1945.

Witkin, H.A., Oltman, P.K., Raskin, E., & Karp, S.A. A manual for the embedded figures tests. Palo Alto: Consulting Psychologists Press, Inc., 1971.

Wittrock, M.C. Education and the cognitive process of the brain. In J.C. Chall and A.F. Mirsky (Eds.), Education and the brain: The seventy-seventh yearbook of the National Society for the Study of Education, Part II. Chicago: University of Chicago Press, 1978.

Yarbuss, A.L. Eye movement in visual perception. New York: Plenum Press, 1967.

Zawel, D. The effects of varying degrees of field dependence on discrimination learning. Dissertation Abstracts International, 1970, 30, 1351B.

APPENDIX A

DIRECTIONS FOR ADMINISTERING INDIVIDUALIZED READING TASKS

DIRECTIONS FOR ADMINISTERING SRUR TASK

I am going to give you a passage to read silently. After you have read it, I will be asking you to recall what you have read. I will audio tape record your response.

Are there any questions?

DIRECTIONS FOR ADMINSITERING SRIR TASK

I am going to give you a passage to read. It is broken into sections. When I tell you to begin, read the section which I give to you silently. When you finish, return the section to me. Then, tell me in your own words what you have just read. I will then ask you what you think will happen next. After this, you will be given the next section to read silently. I will audio tape record what you say.

Are there any questions?

DIRECTIONS FOR ADMINISTERING SRSR TASK

I am going to ask you to read this passage one sentence at a time. You will read each sentence silently and then look at me and think aloud about what you have just read. I will audio tape record what you say.

Are there any questions?

APPENDIX B

TITLE AND SOURCE FOR ALL PASSAGES USED IN PILOT TESTING

* 1. Don't Let Stereotypes Warp Your Judgment, Robert L. Heilbroner in The Persuasive Writer Contemporary English Modules, Deborah Stevens, Silver Burdett, General Learning Corporation, 1975, pp. 33-35, Monistoun, NJ.

2. A Man's Opinion, Jake in The Persuasive Writer Contemporary English Modules, Deborah Stevens, Silver Burdett, General Learning Corporation, 1975, pp. 58-61, Monistoun, NJ.

3. Loosen Up, Lorin Hollander in The Persuasive Writer Contemporary English Modules, Deborah Stevens, Silver Burdett, General Learning Corporation, 1975, pp. 64-70, Monistoun, NJ.

* 4. The Desensitization of Twentieth Century Man, Norman Cousins in The Range of Literature Nonfiction, Myers, Fred B, author, Lynn, Kenneth S. (ed), 1969, Houghton Mifflin Company, New York, pp. 238-241.

* 5. Exploring the Unknown, Lee A. Dubridge in The Range of Literature Nonfiction, Myers, Fred B. (author) and Lynn, Kenneth S. (ed) 1969, Houghton Mifflin Company, New York, pp. 230-236.

6. Freedom to Use the Mind, Mark Van Doren in The Range of Literature Nonfiction, Myers, Fred B. (author) and Lynn, Kenneth S. (ed) 1969, Houghton Mifflin Company, New York, pp. 194-197.

7. Six Ways to tell Right From Wrong, Harry Emerson Fosdick in The Range of Literature Nonfiction, Myers, Fred B. (author) and Lynn, Kenneth S. (ed) 1969, Houghton Mifflin Company, New York, pp. 184-192.

* 8. Reason Tells Us That This Is Wrong from the article entitled What a Catholic Wishes to Avoid in Marriage, pp. 337-339, by John S. Banahan in Controversy Logic in Writing and Reading, by Daniel MacDonald, Chandler Publishing Company, San Francisco City, 1966.

9. Think Along With The Astronomers, Von Del Chamberlain, Astronomer Department of Space and Exploration, National Air and Space Museum, The Smithsonian, Washington, DC, 20560.

10. Ants and Their Social System from Ants Close Up, Chp. 1 by L. Hugh Newman, published by Thomas Y. Crowell Company, New York, 1967, pp. 1-10.

*11. Crocodilians from The Reptile World, 7-21 with omissions, Clifford H. Pope, Published by Alfred A. Knopf, New York, 1955.

12. Chimpanzees and Communication from How Primates Communicate in Language of the Animal World, Chp. II, pp. 35-39 by J.H. Prince, Thomas Nelson Inc., New York, 1975.

13. Poisonous and Dangerous Fishes from The Wonderful World of Fishes, Chapter VIII, pp. 60-65, by Ida Mellen, Dodd, Mead and Company, New York, 1962.

*14. Flies Everywhere from Flies, Keith Snow, Chapter I, pp. 7-14, Priory Press Ltd., East Sussex, Great Britain.

15. The Family Which Dwelt Apart, E.B. White Portfolio 2 Practice Section 3, pp. 8-9, Reading Improvement Program Sponsored by Rutgers University, Book-of-the Month Club Inc., Camp Hill, PA, 1961.

*16. The Unpopular Passenger, Robert Bingham from Stories, by Jennings, Frank G. and Calitri, Charles J., pp. 30-34, Harcourt, Brace and World Inc., New York, 1957.

17. The Free Trappers Winter Diet, Bernard DeVoto Portfolio 2 Practice Section 3, pp. 9-10, Reading Improvement Program Sponsored by Rutgers University, Book-of-the Month Club Inc., Camp Hill, PA, 1961.

18. After 20 Years, O. Henry from Stories, by Jennings, Frank G. and Calitri, Charles J., pp. 46-48, Harcourt, Brace and World Inc., New York, 1957.

19. Impulse, Conrad Aiken in Short Stories Masterpieces, edited by Robert Pern Warren and Albert Erskine, pp. 15-28, Dell Publishing Company, Inc., New York, 1954.

*20. The Catbird Seat, James Thurber in the story A Critical Anthology, Second Edition, edited by Mark Shorer, pp. 93-100, Prentice-Hall, Inc., Anglewood Cliffs, NJ, 1967.

21. Dip in the Pool, Roald Dahl, 86-100 in Short Story, 17th edition, by Richard Lunn, J.M. Dent and Sons Canada Ltd., 1966.

*22. The Homesick Buick, John D. MacDonald, pp. 17-32, in Short Story, 17th edition, by Richard Lunn, by J.M. Dent and Sons Canada Ltd., 1966.

Note: An asterisk indicates passages selected.

APPENDIX C

COMPLETE SELECTIONS USED IN PHASE II RESEARCH

THE HOMESICK BUICK

To get to Leeman, Texas, you go southwest from Beaumont on Route 90 for approximately thirty miles and then turn right on a two-lane concrete farm road. Five minutes from the time you turn, you will reach Leeman. The main part of town is six lanes wide and five blocks long. If the hand of a careless giant should remove the six gas stations, the two theatres, Willows' Hardware Store, the Leeman National Bank, the two big air-conditioned five-and-dimes, the Sears' store, four cafes, Rightsinger's dress shop, and The Leeman House, a twenty-room hotel, there would be very little left except the supermarket and four assorted drugstores.

On October 3, 1949, a Mr. Stanley Woods arrived by bus and carried his suitcase over to The Leeman House. In Leeman there is no social distinction of bus, train, or plane, since Leeman has neither airport facilities nor railroad station.

Of all those who were questioned later, Mr. Stanley Woods seemed to have made very little impression. They all spoke of kind of a medium-sized fella in his thirties, or it might be his forties. No, he wasn't fat, but he wasn't think either. Blue eyes? Could be brown. Wore a gray suit, I think. Can't remember whether his glasses had rims or not. If they did have, they were probably gold.

But all were agreed that Mr. Stanley Woods radiated quiet confidence and the smell of money. According to the cards that were collected from here and there, Mr. Woods represented the Groston Precision Tool Company of Atlanta, Georgia. He had deposited in the Leeman National a certified check for twelve hundred dollars, and the bank had made the routine check of looking up the credit standing of Groston. It was Dun & Bradstreet double-A, but, of course, the company explained later that they had never heard of Mr. Stanley Woods. Nor could the fake calling cards be traced. They were of a type of paper and type face which could be duplicated sixty or a hundred times in every big city in the country.

Mr. Woods' story, which all agreed on, was that he was ". . . nosing around to find a good location for a small plant. Decentralization, you know. No, we don't' want it right in town."

He rented Tod Bishner's car during the day. Tod works at the Shell station on the corner of Beaumont and Lone Star Streets and doesn't have any use for his Plymouth sedan during the day. Mr. Woods drove around all the roads leading out of town, and, of course, real estate prices were jacked to a considerable degree during his stay.

Mr. Stanley Woods left Leeman rather suddenly on the morning of October 17, under unusual circumstances.

The first person to note a certain oddness was Miss Trilla Price on the switchboard at the phone company. Her local calls were all right, but she couldn't place Charley Anderson's call to Houston, nor, when she tried, could she raise Beaumont. Charley was upset because he wanted to wangle an invitation to go visit his sister over the coming weekend.

That was at five minutes of nine. It was probably at the same time that a car with two men in it parked on Beaumont Street, diagonally across from the bank, and one of the two men lifted the hood and began to fiddle with the electrical system.

Nobody agrees from what direction the Buick came into town. There were a man and a girl in it, and they parked near the drugstore. No one seems to know where the third car parked, or even what kind of car it was.

The girl and the man got out of the Buick slowly, just as Stanley Woods came down the street from the hotel.

In Leeman the bank is open on weekdays from nine until two. And so, at nine o'clock, C.F. Hethridge, who is, or was, the chief teller, raised the green shades on the inside of the bank doors and unlocked the doors. He greeted Mr. Woods, who went on over to the high counter at the east wall and began to ponder over his checkbook.

At his point, out on the street, a very peculiar thing happened. One of the two men in the first car strolled casually over and stood beside the Buick. The other man started the motor of the first car, drove down the street, and made a wide U-turn to swing in and park behind the Buick.

The girl and the man had gone over to Bob Kimball's window. Bob is second teller, and the only thing he can remember about the girl is that she was blonde and a little hard-looking around the mouth, and that she wore a great big alligator shoulder bag. The man with her made no impression on Bob at all, except that Bob thinks the man was on the heavy side.

Old Rod Harrigan, the bank guard, was standing beside the front door, yawning, and picking his teeth with a broken match.

At this point C.F. Hethridge heard the buzzer on the big time vault and went over and swung the door wide and went in to get the money for the cages. He was out almost immediately, carrying Bob's tray over to him. The girl was saying something about cashing a check, and Bob had asked her for identification. She had opened the big shoulder bag as her escort strolled over to the guard. At the same moment the girl pulled out a small, vicious-looking revolver and aimed it between Bob's eyes, her escort sapped old Rod Harrigan with such gusto that it was four that same afternoon before he came out of it enough to talk. And then, of course, he knew nothing.

C.F. Hethridge bolted for the vault, and Bob, wondering whether he should step on the alarm, looked over the girl's shoulder just in time to see Stanley Woods aim carefully and bring Hethridge down with a slug through the head, catching him on the fly, so to speak.

Bob says that things were pretty confusing and that the sight of Hethridge dying so suddenly sort of took the heart out of him. Anyway, there was a third car and it contained three men, two of them equipped with empty black-leather suitcases. They went into the vault, acting as though they had been all through the bank fifty times. They stepped over Hethridge on the way in, and on the way out again.

About the only cash they overlooked was the cash right in from of Bob, in his teller's drawer.

As they all broke for the door, Bob dropped and pressed the alarm button. He said later that he held his hands over his eyes, though what good that would do him, he couldn't say.

Henry Willows is the real hero. He was fuddying around in his hardware store when he heard the alarm. With a reaction time remarkable in a man close to seventy, he took a little .22 rifle, slapped a clip into it, trotted to his store door, and quickly analyzed the situation. He saw Mr. Woods, whom he recognized, plus three strangers and a blonde woman coming out of the bank pretty fast. Three cars were lined up, each one with a driver. Two of the men coming out of the bank carried heavy suitcases. Henry leveled on the driver of the lead car, the Buick, and shot him in the left temple, killing him outright. The man slumped over the wheel, his body resting against the horn ring, which, of course, added its blare to the clanging of the bank alarm.

At that point a slug, later identified as having come from a Smith & Wesson Police Positive, smashed a neat hole in Henry's plate-glass store window, radiating cracks in all directions. Henry ducked, and by the time he got ready to take a second shot, the two other cars were gone. The Buick was still there. He saw Bob run out of the bank, and later on he told his wife that he had his finger on the trigger and his sights lined up before it came to him that it was Bob Kimball.

It was agreed that the two cars headed out toward Route 90, and within two minutes Hod Abrams and Lefty Quinn had roared out of town in the same direction in the only police car. They were followed by belligerent amateurs to whom Henry Willows had doled out firearms. But on the edge of town all cars ran into an odd obstacle. The road was liberally sprinkled with metal objects shaped exactly like the jacks that little girls pick up when they bounce a ball, except they were four times normal size and all the points were sharpened. No matter how a tire hit one, it was certain to be punctured.

The police car swerved to a screaming stop, nearly tipping over. The Stein twins, boys of nineteen, managed to avoid the jacks in their souped-up heap until they were hitting eighty. When they finally hit one, the heap rolled over an estimated ten times, killing the twins outright.

So that made four dead, Heathridge, the Stein twins, and one unidentified bank robber.

Nobody wanted to touch the robber, and he stayed right where he was until the battery almost ran down and the horn squawked into silence. Hod Abrams commandeered a car, and he and Lefty rode back into town and took charge. They couldn't get word out by phone, and within a very short time they found that some sharpshooter with a high-powered rifle had gone to work on the towers of local station WLEE and put the station out of business.

Thus, by the time the Texas Rangers were alerted and ready to set up road blocks, indecision and confusion had permitted an entire hour to pass.

The Houston office of the FBI assigned a detail of men to the case, and from the Washington headquarters, two bank-robbery experts were dispatched by plane to Beaumont. Reporters came from Houston and Beaumont and the two national press services, and Leeman found itself on the front pages all over the country because the planning behind the job seemed to fascinate the average joe.

Mr. Woods left town on that particular Thursday morning. The FBI from Houston were there by noon, and the Washington contingent arrived late Friday. Everyone was very confident. There were a corpse and a car to work on. These would certainly provide the necessary clues to indicate which outfit had pulled the job, even though the method of the robbery did not point to any particular group whose habits were known.

Investigation headquarters were set up in the local police station, and Hod and Lefty, very important in the beginning, had to stand around outside trying to look as though they knew what was going on.

Hethridge, who had been a cold, reserved, unpopular man, had, within twenty-four hours, fifty stories invented about his human kindness an generosity. The Stein twins heretofore considered to be trash who would be better off in prison, suddenly became proper sons of old Texas.

Special Agent Randolph A. Sternweister, who, fifteen years before, had found a law office to be a dull place, was in charge of the case, being the senior of the two experts who had flown down from Washington. He was forty-one years old, a chain smoker, a chubby man with incongruous hollow cheeks and hair of a shade of gray which his wife, Claire, tells him is distinguished.

The corpse was the first clue. Age, between thirty and thirty-two. Brown hair, thinning on top. Good teeth, with only four small cavities, two of them filled. Height, five feet eight and a quarter; weight, a hundred and forty-eight. No distinguishing scars or tattoos. X-ray plates showed that the right arm had been fractured years before. His clothes were neither new or old. The suit had been purchased in Chicago. The shirt, underwear, socks, and shoes were all national brands, in the medium-price range. In his pockets they found an almost full pack of cigarettes, a battered Zippo lighter, three fives and a one in a cheap trick billclip, eight-five cents in change, a book of matches advertising a nationally known laxative, a white bone button, two wooden kitchen matches with blue-and-white heads, and a pencilled map, on cheap notebook paper, of the main drag of Leeman--with no indication as to escape route. His fingerprint classification was teletyped to the Central Bureau files, and the answer came back that there was no record of him. It was at this point that fellow workers noted that Mr. Sternweister became a shade irritable.

The next search of the corpse was more minute. No specific occupational calluses were found on his hands. The absence of laundry marks indicated that his linen, if it had been sent out, had been cleaned by a neighborhood laundress. Since Willows had used a .22 hollow-point, the hydraulic pressure on the brain fluids had caused the eyes of Mr. X to bulge in a disconcerting fashion. A local undertaker, experienced in the damage caused by the average Texas automobile accident, replaced the bulging eyeballs and smoothed out the expression for a series of pictures which were sent to many points. The Chicago office reported that the clothing store which had sold the suit was large and that the daily traffic was such that no clerk could identify the customer from the picture, nor was the youngish man known to the Chicago police.

Fingernail scrapings were put in a labeled glassine envelope, as well as the dust vacuumed from pants' cuffs and other portions of the clothing likely to collect dust. The excellent lab in Houston reported back that the dust and scrapings were negative to the extent that the man could not be tied down to any particular locality.

In the meantime the Buick had been the object of equal scrutiny. The outside was a mass of prints from the citizens of Leeman who had peered morbidly in at the man leaning against the horn ring. The plates were Mississippi license plates, and in checking with the Bureau of Motor Vehicle Registration, it was found that the plates had been issued for a 1949 Mercury convertible which had been almost totally destroyed in a head-on collision in June, 1949. The motor number and serial number of the Buick were checked against central records, and it was discovered that the Buick was one which had disappeared from Chapel Hill, North Carolina, on the 5th day of July, 1949. The insurance company, having already replaced the vehicle, was anxious to take possession of the stolen car.

Pictures of Mr. X, relayed to Chapel Hill, North Carolina, and to myriad points in Mississippi, drew a large blank. In the meantime a careful dusting of the car had brought out six prints, all different. Two of them turned out to be on record. The first was on record through the cross-classification of Army prints. The man in question was found working in a gas station in Lake Charles, Louisiana. He had a very difficult two hours until a bright police officer had him demonstrate his procedure for brushing out the front of a car. Ex-Sergeant Golden braced his left hand against the dashboard in almost the precise place where the print had been found. He was given a picture of Mr. X to study. By that time he was so thoroughly annoyed at the forces of law and order that it was impossible to ascertain whether or not he had ever seen the man in question. But due to the apparent freshness of the print it was established--a reasonable assumption--that the gangsters had driven into Texas from the East.

The second print on record was an old print, visible when dust was carefully blown off the braces under the dismantled front seat. It belonged to a garage mechanic in Chapel Hill, who once had a small misunderstanding with the forces of law and order and who was able to prove, through the garage work orders, that he had repaired the front-seat mechanism when it had jammed in April, 1949.

The samples of road dirt and dust taken from the fender wells and the frame members proved nothing. The dust was proved, spectroscopically, to be from deep in the heart of Texas, and the valid assumption, after checking old weather reports, was that the car had come through some brisk thunderstorms en route.

Butts in the ash tray of the car showed that either two women, or one woman with two brands of lipstick, had ridden recently as a passenger. Both brands of lipstick were shades which would go with a fair-complexioned blonde, and both brands were available in Woolworth's, Kress', Kresge's, Walgreen's--in fact, in every chain outfit of any importance.

One large crumb of stale whole-wheat bread was found on the floor mat, and even Sternweister could make little of that, despite the fact that the lab was able to report that the bread had been eaten in conjunction with liverwurst.

Attention was given to the oversized jacks which had so neatly punctured the tires. An ex-OSS officer reported that similar items had been scattered on enemy roads in Burma during the late war, and after examining the samples, he stated confidently that the OSS merchandise had been better made. A competent machinist looked them over and stated with assurance that they had been made by cutting eight-inch rods into short lengths, grinding them on a wheel, putting them in a jig, and spot-welding them. He said that the maker did not do much of a job on either the grinding or the welding, and that the jig itself was a little out of line. An analysis of the steel showed that it was a Jones & Laughlin product that could be bought in quantity at any wholesaler and in a great many hardware stores.

The auditors, after a careful examination of the situation at the bank, reported that the sum of exactly $94,725 had disappeared. They recommended that the balance of $982.80 remaining in Stanley Woods' account be considered as forfeited, thus reducing the loss to $93,742.20. The good citizens of Leeman preferred to think that Stanley had withdrawn his account.

Every person who had a glimpse of the gang was cross-examined. Sternweister was appalled at the difficulty involved in even establishing how many there had been. Woods, the blonde, and the stocky citizen were definite. And then there were two with suitcases--generally agreed upon. Total, so far--five. The big question was whether each car had a driver waiting. Some said no--that the last car in line had been empty. Willows insisted angrily that there had been a driver behind each wheel. Sternweister at last settled for a total of eight, seven of whom escaped.

No one had taken down a single license number. But it was positively established that the other two cars had been either two- or four-door sedans in dark blue, black, green, or maroon, and that they had been either Buicks, Nashes, Oldsmobiles, Chryslers, Pontiacs, or Packards--or maybe Hudsons. And one lone woman held out for convertible Cadillacs. For each person that insisted that they had Mississippi registration, there was one equally insistent on Louisiana, Texas, Alabama, New Mexico, and Oklahoma. And one old lady said that she guessed she knew a California plate when she saw one.

On Saturday morning, nine days after the sudden blow to the FDIC, Randolph Sternweister paced back and forth in his suite at the hotel, which he shared with the number-two man from the Washington end, one Buckley Weed. Weed was reading through the transcripts of the testimony of the witnesses, in vain hope of finding something to which insufficient importance had been given. Weed, though lean, a bit stooped, and only thirty-one, had, through osmosis, acquired most of the personal mannerisms of his superior. Sternweister had noticed this and for the past year had been on the verge of mentioning it. As Weed had acquired Sternweister's habit of lighting one cigarette off the last half-inch of the preceeding one, any room in which the two of them remained for more than an hour took on the look and smell of any hotel room after a Legion convention.

"Nothing," Sternweister said. "Not one censored, unmentionable, unprintable, unspeakable thing! My God, if I ever want to kill anybody, I'll do it in the Pennsy Station at five-fifteen."

"Yes, at five-fifteen," said Weed.

"The Bureau has cracked cases when the only thing it had to go on was a human hair or a milligram of dust. My God, we've got a whole automobile that weighs nearly two tons, and a whole corpse! They'll think we're down here learning to rope calves. You know what?"

"What, Ran?"

"I think this was done by a bunch of amateurs. There ought to be a law restricting the practice of crime to professionals. A bunch of wise amateurs. And you can bet your loudest argyles, my boy, that they established identity, hide-out, the works, before they knocked off that vault. Right now, blast their souls, they're being seven average citizens in some average community, making no splash with that ninety-four grand. People didn't used to move around so much. Since the war they've been migrating all over the place. Strangers don't stick out like sore thumbs any more. See anything in those transcripts?"

"Nothing."

"Then stop rattling paper. I can't think. Since a week ago Thursday, fifty-one stolen cars have been recovered in the South and Southwest. And we don't know which two, if any, belonged to this mob. We don't even know which route they took away from here. Believe it or not--nobody saw 'em!"

As the two specialists stared bleakly at each other, a young man of fourteen named Pink Dee was sliding inconspicuously through the shadows in the rear of Louie's Garage (Tow car service--open 24 hrs.). Pink was considered to have been the least beautiful baby, the most unprepossessing child, in Leeman, and he gave frank promise of growing up to be a rather coarse joke on the entire human race. Born with a milk-blue skin, dead-white hair, little reddish weak eyes, pipe-cleaner bones, narrow forehead, no chin, beaver teeth, a voice like an unoiled hinge, nature had made the usual compensation. His reaction time was exceptional. Plenty of more rugged and more normal children had found out that Pink Dee could hit you by the time you had the word out of your mouth. The blow came from an outsize, knobby fist at the end of a long thin arm, and he swung it with all the abandon of a bag of rocks on the end of a rope.

The second important item about Pink Dee came to light when the Leeman School System started giving IQs. Pink's was higher than they were willing to admit the first time, as it did not seem proper that the only genius in Leeman should be old Homer Dee's only son. Pink caught on, and the second time he was rated he got it down in the cretin class. The third rating was ninety-nine, and everybody seemed happy with that.

At fourteen Pink was six feet tall and weighed a hundred and twenty pounds. He peered at the world through heavy lenses and maintained, in the back room of his home on Fountain Street, myriad items of apparatus, some made, some purchased. There he investigated certain electrical and magnetic phenomena, having tired of building radios, and carried on a fairly virulent correspondence on the quantum theory with a Cal Tech professor who was under the impression that he was arguing with someone of more mature years.

Dressed in his khakis, Pink moved through the shadows, inserted the key he had filched into the Buick door, and then into the ignition lock. He turned it to the left to activate the electrical gimmicks, and then turned on the car radio. As soon as it warmed up, he pushed the selector buttons carefully noting the dial. When he had the readings, he turned it to WLEE to check the accuracy of the dial. When WLEE roared into a farm report, Louie appeared and dragged Pink out by the thin scruff of his neck.

"What the hell?" Louie said.

Being unable to think of any adequate explanation, Pink wriggled away and loped out.

Pink's next stop was WLEE, where he was well known. He found the manual he wanted and spent the next twenty minutes leafing through it.

Having been subjected to a certain amount of sarcasm from both Sternweister and Weed, Hod Abrams and Lefty Quinn were in no mood for the approach Pink Dee used.

"I demand to see the FBI," Pink said firmly, the effect spoiled a bit by the fact that his voice change was so recent that the final syllable was a reversion to his childhood squeaky-hinge voice.

"He demands," Hod said to Lefty.

"Go away, Pink," Lefty growled, "before I stomp on your glasses."

"I am a citizen who wishes to speak to a member of a federal agency," Pink said with dignity.

"A citizen, maybe. A taxpayer, no. You give me trouble, kid, and I'm going to warm your pants right here in this lobby."

Maybe the potential indignity did it. Pink darted for the stairs leading up from the lobby. Hod went roaring up the stairs after him, and Lefty grabbed the elevator. They both snared him outside Sternweister's suite and found that they had a job on their hands. Pink bucked and contorted like a picnic on which a hornet's nest had just fallen.

The door to the suite opened and both Sternweister and Weed glared out, their mouths open.

"Just . . . just a fresh . . . kid," Hod Abrams panted.

"I know where the crooks are!" Pink screamed.

"He's nuts," Lefty yelled.

"Wait a minute," Randolph Sternweister ordered sharply. They stopped dragging Pink but clung to him. "I admit he doesn't look as though he knew his way home, but you can't tell. You two wait outside. Come in here, young man."

Pink marched erectly into the suite, selected the most comfortable chair, and sank into it, looking very smug.

"Where are they?"

"Well, I don't know exactly--"

"Outside!" Weed said with a thumb motion.

"--but I know how to find out."

"Oh, you know how to find out, eh? Keep talking. I haven't laughed in nine days," Sternweister said.

"Oh, I had to do a little checking first," Pink said in a lofty manner. "I stole the key to the Buick and got into it to test something."

"Kid, experts have been over that car, half-inch by half-inch."

"Please don't interrupt me, sir. And don't take that attitude. Because if it turns out I have something, and I know I have, you're going to look as silly as anything."

Sternweister flushed and then turned pale. He held hard to the edge of a table. "Go ahead," he said thickly.

"I am making an assumption that the people who robbed our bank started out from some hide-out and then went back to the same one. I am further assuming that they were in their hide-out some time--that is, while they were planning the robbery."

Weed and Sternweister exchanged glances. "Go on."

"So my plan has certain possible flaws based on these assumptions, but at least it uncovers one possible pattern of investigation. I know that the car was stolen from Chapel Hill. That was in the paper. And I know the dead man was in Chicago. So I checked Chicago and Chapel Hill a little while ago."

"Checked them?"

"At the radio station, of course. Modern car radios are easy to set to new stations by altering the push buttons. The current settings of the push buttons do not conform either to the Chicago or the Chapel Hill areas. There are six stations that the radio in the Buick is set for, and--"

Sternweister sat down on the couch as though somebody had clubbed him behind the knees. "Agh!" he said.

"So all you have to do," Pink said calmly, "is to check areas against the push-button settings until you find an area where all six frequencies are represented by radio stations in the immediate geographical vicinity. It will take a bit of statistical work, of course, and a map of the country, and a supply of push pins should simplify things, I would imagine. Then, after the area is located, I would take the

Buick there, and due to variations in individual sets and receiving conditions, you might be able to narrow it down to within a mile or two. Then, ~~by~~ showing the photograph of the dead gangster at bars and such places--"

And that was why, on the following Wednesday, a repainted Buick with new plates and containing two agents of the Bureau roamed through the small towns near Tampa on the West Florida Coast, and how they found that the car radio in the repainted Buick brought in Tampa, Clearwater, St. Pete, Orlando, Winter Haven, and Dunedin on the push buttons with remarkable clarity the closer they came to a little resort town called Tarpon Springs. On Thursday morning at four, the portable floodlight bathed three beach cottages in a white glare, and the metallic voice of the P.A. system said, "You are surrounded. Come out with your hands high. You are surrounded."

The shots, a few moments later, cracked with a thin bitterness against the heavier sighing of the Gulf of Mexico. Mr. Stanley Woods, or, as the blonde later stated, Mr. Grebbs Fainstock, was shot, with poetic justice, through the head, and that was the end of resistance.

On Pink Dee Day in Leeman, the president of the Leeman National Bank turned over the envelope containing the reward. It came to a bit less than six percent of the recovered funds, and it is ample to guarantee, at some later date, a Cal Tech degree.

In December the Sternweisters bought a new car. When Claire demanded to know why Randolph insisted on delivery sans car radio, his only answer was a hollow laugh.

She feels that he has probably been working too hard.

THE CATBIRD SEAT

Section I

Mr. Martin bought the pack of Camels on Monday night in the most crowded cigar store on Broadway. It was theatre time and seven or eight men were buying cigarettes. The clerk didn't even glance at Mr. Martin, who put the pack in his overcoat pocket and went out. If any of the staff at F & S had seen him buy the cigarettes, they would have been astonished, for it was generally known that Mr. Martin did not smoke, and never had. No one saw him.

It was just a week to the day since Mr. Martin had decided to rub out Mrs. Ulgine Barrows. The terms "rub out" pleased him because it suggested nothing more than the correction of an error--in this case an error of Mr. Fitweiler. Mr. Martin had spent each night of the past week working out his plan and examining it. As he walked home now he went over it again. For the hundredth time he resented the element of imprecision, the margin of guesswork that entered into the business. The project as he had worked it out was casual and bold, the risks were considerable. Something might go wrong anywhere along the line. And therein lay the cunning of his scheme. No one would ever see in it the cautious, painstaking hand of Erwin Martin, head of the filing department at F & S, of whom Mr. Fitweiler had once said, "Man is fallible but Martin isn't." No one would see his hand, that is, unless it were caught in the act.

Section II

Sitting in his apartment, drinking a glass of milk, Mr. Martin reviewed his case against Mrs. Ulgine Barrows, as he had every night for seven nights. He began at the beginning. Her quacking voice and braying laugh had first profaned the halls of F & S on March 7, 1941 (Mr. Martin had a head for dates). Old Roberts, the personnel chief, had introduced her as the newly appointed special adviser to the president of the firm, Mr. Fitweiler. The woman had appalled Mr. Martin instantly, but he hadn't shown it. He had given her his dry hand, a look of studious concentration, and a faint smile. "Well," she had said, looking at the papers on his desk, "are you lifting the oxcart out of the ditch?" As Mr. Martin recalled that moment, over his milk, he squirmed slightly. He must keep his mind on her crimes as a special adviser, not on her peccadillos as a personality. This he found difficult to do, in spite of entering an objection and sustaining it. The faults of the woman as a woman kept chattering on in his mind like an unruly witness. She had, for almost two years now, baited him. In the halls, in the elevator, even in his own office, into which she romped now and then like a circus horse, she was constantly shouting these silly questions at him. "Are you lifting the oxcart out of the ditch? Are you tearing up the pea patch? Are you hollering down the rain barrel? Are you scraping around the bottom of the pickle barrel? Are you sitting in the catbird seat?"

Section III

It was Joey Hart, one of Mr. Martin's two assistants, who had explained what the gibberish meant. "She must be a Dodger fan," he had said. "Red Barber announces the Dodger games over the radio and he uses those expressions--picked 'em up down South." Joey had gone on to explain one or two. "Tearing up the pea patch" meant going on a rampage; "sitting in the catbird seat" meant sitting pretty, like a batter with three balls and no strikes on him. Mr. Martin dismissed all this with an effort. It had been annoying, it had driven him near to distraction, but he was too solid a man to be moved to murder by anything so childish. It was fortunate, he reflected as he passed on to the important charges against Mrs. Barrows, that he had stood up under it so well. He had maintained always an outward appearance of polite tolerance. "Why, I even believe you like the woman," Miss Paird, his other assistant, had once said to him. He had simply smiled.

A gavel rapped in Mr. Martin's mind and the case proper was resumed. Mrs. Ulgine Barrows stood charged with willful, blatant, and persistent attempts to destroy the efficiency and system of F & S. It was competent, material, and relevant to review her advent and rise to power. Mr. Martin had got the story from Miss Paird, who seemed always able to find things out. According to her, Mrs. Barrows had met Mr. Fitweiler at a party, where she had rescued him from the embraces of a powerfully built drunken man who had mistaken the president of F & S for a famous retired Middle Western football coach. She had led him to a sofa and somehow worked upon him a monstrous magic. The aging gentlemen had jumped to the conclusion there and then that this was a woman of singular attainments, equipped to bring out the best in him and in the firm. A week later he had introduced her into F & S as his special adviser. On that day confusion got its foot in the door. After Miss Tyson, Mr. Brundage, and Mr. Bartlett had been fired and Mr. Munson had taken his hat and stalked out, mailing in his resignation later, old Roberts had been emboldened to speak to Mr. Fitweiler. He mentioned that Mr. Munson's department had been "a little disrupted" and hadn't they perhaps better resume the old system there? Mr. Fitweiler had said certainly not. He had the greatest faith in Mrs. Barrows' ideas. "They require a little seasoning, a little seasoning, is all," he had added. Mr. Roberts had given it up. Mr. Martin reviewed in detail all the changes wrought by Mrs. Barrows. She had begun chipping at the cornices of the firm's edifice and now she was swinging at the foundation stones with a pickaxe.

Section IV

Mr. Martin came now, in his summing up, to the afternoon of Monday, November 2, 1942--just one week ago. On that day, at 3 p.m., Mrs. Barrows had bounced into his office. "Boo!" she had yelled. "Are you scraping around the bottom of the pickle barrel?" Mr. Martin had looked at her from under his green eyeshade, saying nothing. She had begun to wander about the office, taking it in with her great, popping eyes. "Do you really need all these filing cabinets?" she had demanded suddenly. Mr. Martin's heart had jumped. "Each of these files," he had said, keeping his voice even, "plays an indispensable part in the system of F & S." She had brayed at him, "Well, don't tear up the pea patch!" and gone to the door. From there she had bawled "But you sure have got a lot of fine scrap in here!" Mr. Martin could no longer doubt that the finger was on his beloved department. Her pickaxe was on the upswing, poised for the first blow. It had not come yet, he had received no blue memo from the enchanted Mr. Fitweiler bearing nonsensical instructions deriving from the obscene woman. But there was no doubt in Mr. Martin's mind that one would be forthcoming. He must act quickly. Already a precious week had gone by. Mr. Martin stood up in his living room, still holding his milk glass. "Gentlemen of the jury," he said to himself, "I demand the death penalty for this horrible person."

The next day Mr. Martin followed his routine, as usual. He polished his glasses more often and once sharpened an already sharp pencil, but not even Miss Paird noticed. Only once did he catch sight of his victim; she swept past him in the hall with a patronizing "Hi!" At five-thirty he walked home, as usual, and had a glass of milk, as usual. He had never drunk anything stronger in his life--unless you could count ginger ale. The late Sam Schlosser, the S of F & S, had praised Mr. Martin at a staff meeting several years before for his temperate habits. "Our most efficient worker neither drinks or smokes," he had said. "The results speak for themselves." Mr. Fitwieler had sat by, nodding approval.

Section V

Mr. Martin was still thinking about that red-letter day as he walked over to the Schrafft's on Fifth Avenue near Forty-sixth Street. He got there, as he always did, at eight o'clock. He finished his dinner and the financial page of the Sun at a quarter to nine, as he always did. It was his custom after dinner to take a walk. This time he walked down Fifth Avenue at a casual pace. His gloved hands felt moist and warm, his forehead cold. He transferred the Camels from his overcoat to a jacket pocket. He wondered, as he did so, if they did not represent an unnecessary note of strain. Mrs. Barrows smoked only Luckies. It was his idea to puff a few puffs on a Camel (after the rubbing-out), stub it out in the ash tray holding her lipstick-stained Luckies, and thus drag a small red herring across the trail. Perhaps it was not a good idea. It would take time. He might even choke, too loudly.

Mr. Martin had never seen the house on West Twelfth Street where Mrs. Barrows lived, but he had a clear enough picture of it. Fortunately, she had bragged to everybody about her ducky first-floor apartment in the perfectly darling three-story red-brick. There would be no doorman or other attendants; just the tenants of the second and third floors. As he walked along, Mr. Martin realized that he would get there before nine-thirty. He had considered walking north on Fifth Avenue from Schrafft's to a point from which it would take him until ten o'clock to reach the house. At that hour people were less likely to be coming in or going out. But the procedure would have made an awkward loop in the straight thread of his casualness, and he had abandoned it. It was impossible to figure when people would be entering or leaving the house, anyway. There was a great risk at any hour. If he ran into anybody, he would simply have to place the rubbing-out of Ulgine Barrows in the inactive file forever. The same thing would hold true if there were someone in her apartment. In that case he would just say that he had been passing by, recognized her charming house, and thought to drop in.

Section VI

It was eighteen minutes after nine when Mr. Martin turned into Twelfth Street. A man passed him, and a man and a woman talking. There was no one within fifty paces when he came to the house, halfway down the block. He was up the steps and in the small vestibule in no time, pressing the bell under the card that said "Mrs. Ulgine Barrows." When the clicking in the lock started, he jumped forward against the door. He got inside fast, closing the door behind him. A bulb in a lantern hung from the hall ceiling on a chain seemed to give a monstrously bright light. There was nobody on the stair, which went up ahead of him along the left wall. A door opened down the hall in the wall on the right. He went toward it swiftly, on tiptoe.

"Well, for God's sake, look who's here!" bawled Mrs. Barrows, and her braying laugh rang out like the report of a shotgun. He rushed past her like a football tackle, bumping her. "Hey, quit shoving!" she said, closing the door behind them. They were in her living room which seemed to Mr. Martin to be lighted by a hundred lamps. "What's after you?" she said. "You're as jumpy as a goat." He found he was unable to speak. His heart was wheezing in his throat. "I--yes," he finally brought out. She was jabbering and laughing as she started to help him off with his coat. "No, no," he said. "I'll put it here." He took it off and put it on a chair near the door. "Your hat and gloves, too," she said. "You're in a lady's house." He put his hat on top of the coat. Mrs. Barrows seemed larger than he had thought. He kept his gloves on. "I was passing by," he said. "I recognized--is there anyone here?" She laughed louder than ever. "No," she said, "we're all alone. You're as white as a sheet, you funny man. Whatever has come over you? I'll mix you a toddy." She started toward a door across the room. "Scotch-and-soda be all right? But say, you don't drink do you?" She turned and gave him her amused look. Mr. Martin pulled himself together. "Scotch-and-soda will be all right," he heard himself say. He could hear her laughing in the kitchen.

Section VII

Mr. Martin looked quickly around the living room for the weapon. He had counted on finding one there. There were andirons and a poker and something in a corner that looked like an Indian club. None of them would do. It couldn't be that way. He began to pace around. He came to a desk. On it lay a metal paper knife with an ornate handle. Would it be sharp enough? He reached for it and knocked over a small brass jar. Stamps spilled out of it and it fell to the floor with a clatter. "Hey," Mrs. Barrows yelled from the kitchen, "are you tearing up the pea patch?" Mr. Martin gave a strange laugh. Picking up the knife, he tried its point against his left wrist. It was blunt. It wouldn't do.

When Mrs. Barrows reappeared, carrying two highballs, Mr. Martin, standing there with his gloves on, became acutely conscious of the fantasy he had wrought. Cigarettes in his pocket, a drink prepared for him--it was all to grossly improbable. It was more than that, it was impossible. Somewhere in the back of his mind a vague idea stirred, sprouted. "For heaven's sake, take off those gloves," said Mrs. Barrows. "I always wear them in the house," said Mr. Martin. The idea began to bloom, strange and wonderful. She put the glasses on a coffee table in front of a sofa and sat on the sofa. "Come over here, you odd little man," she said. Mr. Martin went over and sat beside her. It was difficult getting a cigarette out of the pack of Camels, but he managed it. She held a match for him, laughing. "Well," she said, handing him his drink, "this is perfectly marvellous. You with a drink and a cigarette."

Section VIII

Mr. Martin puffed, not too awkwardly, and took a gulp of the highball. "I drink and smoke all the time," he said. He clinked his glass against hers. "Here's nuts to that old windbag, Fitweiler," he said, and gulped again. The stuff tasted awful, but he made no grimace. "Really, Mr. Martin," she said, her voice and posture changing, "you are insulting our employer." Mrs. Barrows was now all special adviser to the president. "I am preparing a bomb," said Mr. Martin, "which will blow the old goat higher than hell." He had only had a little of the drink, which was not strong. It couldn't be that. "Do you take dope or something?" Mrs. Barrows asked coldly. "Heroin," said Mr. Martin. "I'll be coked to the gills when I bump that old buzzard off." "Mr. Martin!" she shouted, getting to her feet. "That will be all of that. You must go at once." Mr. Martin took another swallow of his drink. He tapped his cigarette out in the ash tray and put the pack of Camels on the coffee table. Then he got up. She stood glaring at him. He walked over and put on his hat and coat. "Not a word about this," he said, and laid an index finger against his lips. All Mrs. Barrows could bring out was "Really!" Mr. Martin put his hand on the doorknob. "I'm sitting in the catbird seat," he said. He stuck his tongue out at her and left. Nobody saw him go.

Section IX

Mr. Martin got to his apartment, walking well before eleven. No one saw him go in. He had two glasses of milk after brushing his teeth and felt elated. It wasn't tipsiness, because he hadn't been tipsy. Anyway, the walk had worn off all effects of the whisky. He got in bed and read a magazine for a while. He was asleep before midnight.

Mr. Martin got to the office at eight-thirty the next morning, as usual. At a quarter to nine, Ulgine Barrows, who had never before arrived at work before ten, swept into his office. "I'm reporting to Mr. Fitweiler now!" she shouted. "If he turns you over to the police, it's no more than you deserve!" Mr. Martin gave her a look of shocked surprise. "I beg your pardon?" he said. Mrs. Barrows snorted and bounced out of the room, leaving Miss Paird and Joey Hart staring after her. "What's the matter with that old devil now?" asked Miss Paird. "I have no idea," said Mr. Martin, resuming his work. The other two looked at him and then at each other. Miss Paird got up and went out. She walked slowly past the closed door of Mr. Fitweiler's office. Mrs. Barrows was yelling inside, but she was not braying. Miss

Paird could not hear what the woman was saying. She went back to her desk.

Forty-five minutes later, Mrs. Barrows left the president's office and went into her own, shutting the door. It wasn't until half an hour later that Mr. Fitweiler sent for Mr. Martin. The head of the filing department, neat, quiet, attentive, stood in front of the old man's desk. Mr. Fitweiler was pale and nervous. He took his glasses off and twiddled them. He made a small, bruffing sound his throat. "Martin," he said, "you have been with us more than twenty years." "Twenty-two, sir," said Mr. Martin. "In that time," pursued the president, "your work and your--uh--manner have been exemplary." "I trust so, sir," said Mr. Martin. "I have understood, Martin," said Mr. Fitweiler, "that you have never taken a drink or smoked." "That is correct, sir," said Mr. Martin. "Ah, yes," Mr. Fitweiler polished his glasses. "You may describe what you did after leaving the office yesterday, Martin," he said. Mr. Martin allowed less than a second for his bewildered pause. "Certainly, sir" he said. "I walked home. Then I went to Schrafft's for dinner. Afterward I walked home again. I went to bed early, sir, and read a magazine for a while. I was asleep before eleven." "Ah, yes," said Mr. Fitweiler again. He was silent for a moment, searching for the proper words to say to the head of the filing department. "Mrs. Barrows," he said finally, "Mrs. Barrows has worked hard, Martin, very hard. It grieves me to report that she has suffered a severe breakdown. It has taken the form of a persecution complex accompanied by distressing hallucinations." "I am very sorry, sir," said Mr. Martin. "Mrs. Barrows is under the delusion," continued Mr. Fitweiler, "that you visited her last evening and behaved yourself in an--uh--unseemly manner." He raised his hand to silence Mr. Martin's little pained outcry. "It is the nature of these psychological diseases," Mr. Fitweiler said, "to fix upon the least likely and most innocent party as the--uh--source of persecution. These matters are not for the lay mind to grasp, Martin. I've just had my psychiatrist, Dr. Fitch, on the phone. He would not, of course, commit himself, but he made enough generalizations to substantiate my suspicions. I suggested to Mrs. Barrows, when she had completed her--uh--story to me this morning, that she visit Dr. Fitch, for I suspected a condition at once. She flew, I regret to say, into a rage, and demanded--uh--requested that I call you on the carpet. You may not know, Martin, but Mrs. Barrows had planned a reorganization of your department--subject to my approval, of course, subject to my approval. This brought you, rather than anyone else, to her mind--but again that is a phenomenon for Dr. Fitch and not for us. So, Martin, I am afraid Mrs. Barrows' usefulness here is at an end." "I am dreadfully sorry, sir," said Mr. Martin.

Section X

It was at this point that the door to the office blew open with the suddenness of a gas-main explosion and Mrs.

Barrows catapulted through it. "Is the little rat denying it?" she screamed. "He can't get away with that!" Mr. Martin got up and moved discreetly to a point beside Mr. Fitweiler's chair. "You drank and smoked at my apartment," she bawled at Mr. Martin, "and you know it! You called Mr. Fitweiler an old windbag and said you were going to blow him up when you got coked to the gills on your heroin!" She stopped yelling to catch her breath and a new glint came into her popping eyes. "If you weren't such a drab, ordinary little man," she said, "I'd think you'd planned it all. Sticking your tongue out, saying you were sitting in the catbird seat, because you thought no one would believe me when I told it! My God, it's really too perfect!" She brayed loudly and hysterically, and the fury was on her again. She glared at Mr. Fitweiler. "Can't you see how he has tricked us, you old fool? Can't you see his little game?" But Mr. Fitweiler had been surreptitously pressing all the buttons under the top of his desk and employees of F & S began pouring into the room. "Stockton," said Mr. Fitweiler, "you and Fishbein will take Mrs. Barrows to her home. Mrs. Powell, you will go with them." Stockton, who had played a little football in high school, blocked Mrs. Barrows as she made for Mr. Martin. It took him and Fishbein together to force her out of the door into the hall, crowded with stenographers and office boys. She was still screaming imprecations at Mr. Martin, tangled and contradictory imprecations. The hubbub finally died out down the corridor.

"I regret that this has happened," said Mr. Fitweiler. "I shall ask you to dismiss it from your mind, Martin." "Yes, sir," said Mr. Martin, anticipating his chief's "That will be all" by moving to the door. "I will dismiss it." He went out and shut the door, and his step was light and quick in the hall. When he entered his department he had slowed down to his customary gait, and he walked quietly across the room to the W20 file, wearing a look of studious concentration.

THE UNPOPULAR PASSENGER

Snow was falling out of the dark into the tiny cones of light under street lamps down below as the plane circled to land at Cleveland. When the hostess saw that I was awake and that my safety belt was already fastened, she smiled efficiently and moved on down the aisle, waking the other passengers and asking them to fasten their safety belts. I did not make the effort to return her smile but turned again to look down on the miniature suburbs below.

The young soldier sitting next to me stretched awake and looked out the window too. "Must be a late party at that house," he said, through a yawn. He pointed to where the lights were on in one-half of a brick two-family house on a street of unlighted but otherwise identical brick two-family houses. Or somebody dying, was my first thought.

Being awake at three or four in the morning, sober and bored, waiting only for a certain time to elapse or a certain distance to be traveled, reminded me inevitably of my own days and nights as a soldier, of an emptiness in which at last even the too familiar prospect of death loses its power to provoke emotion.

After hovering uncertainly in the air, the plane settled clumsily on the ground, stumbled to a stop, and then waddled into the brightly lighted area round the terminal building, wheezing and gasping. "One hour and forty-five minutes late," declared a resonant bass voice several seats behind me. "I told them we'd be there at a decent hour, but at this rate we won't be there before dawn." Several other passengers glanced at their wrist watches.

Those of us who were getting off at Cleveland stood in the aisle, and while I waited behind a woman with yellowish-white hair who was pointing at things she wanted her husband to pass down from the luggage rack, I was pushed abruptly against my seat by a short, fat man wearing a broad-brimmed blue hat that fitted down very far on his head. He also pushed the woman in front of me, and with an exaggerated cry of alarm she let herself fall back into the seat from which she had just arisen. A thick fox scarf had fallen onto the floor and lay there staring up at its mistress with eyes of orange bead. The woman snatched the animal to her and shook it violently. "Really!" she said indignantly, glaring back down the aisle at her assailant, who by this time had forced his way through the other passengers to be the first one out of the plane when the door was opened. Then she glared at her husband, a small man with steel-rimmed glasses, who averted his eyes and reached for a patent-leather hatbox. "Really!" the woman said again, this time loud enough for everyone in the plane to hear. "Some people just have no consideration."

When I left the plane I found the man in the big hat blocking my way at the bottom of the portable stairway. He was breathing heavily. "Hey, there, Miss Hostess!" he shouted past me up at the door of the plane. "I got to make a phone call." He coughed and turned his head to spit. "So where's the phone?" His face was made up of four round and very nearly equal bulbs of flesh--a forehead, two cheeks, and a nose. Under this last bulb a large lower lip hung down, wet and open.

The hostess suggested that if he would follow the other passengers to the terminal building he would find public telephones in the lobby. After glancing suspiciously through the screen of soft, dry snow in the direction she had pointed, he wheeled himself around and trotted awkwardly away on his short legs.

"And not one word of thanks, you'll notice," said the woman with the yellowish-white hair, clutching the bright-eyed fox firmly about her throat.

Even though the short, fat man had run all the way, I got to the terminal building almost as soon as he did. "Hey, there, Johnny!" he shouted to a uniformed pilot. "I got to make a phone call." He snapped his plump fingers impatiently. Looking down on the man in the big hat, the pilot permitted his mustache to twitch several times before he jerked his thumb contemptuously over his shoulder and paraded away.

Just outside the only booth that was free, two men had set down their briefcases and were going through their pockets for change, but the man in the big hat dived right between them toward the booth. "Just a minute there, my friend," said one of the men, taking hold of the intruder's elbow. It was the same resonant bass voice I had heard on the plane.

"I got to make a phone call," said the man in the big hat, weaving himself free of the taller man's grip and working his way into the booth.

"Oh, you got to make a phone call, have you?" the man with the deep voice mimicked. "Well, listen, my friend, I got to make a phone call, too and I was here first."

The man in the big hat drew in his breath and seemed about to speak, but instead he broke the grip on his elbow with a sudden snap and slammed the collapsible door of the booth shut behind him.

His mouth held open as if in speechless amazement, the man with the deep voice turned to his companion for confirmation of what he had just seen.

"How come you let him get away with that?" said the other man, stuttering slightly. The man with the deep voice stared angrily into the booth but said nothing. The voice from the booth, alternatingly threatening and pleading, was loud but indistinct. He might have been speaking in a foreign language.

The snack bar and the magazine stand were boarded over for the night, and so I stood outside near the limousine that would take me to downtown Cleveland and waited for the baggage to be brought around. The night was cold: I felt the walls of my nostrils sticking together, and the snow groaned and complained under my feet. Both the lights and the sounds of the airport were dimmed by the thickly falling snow.

Out of the dark a crowd loomed up upon me. There were five passengers, a man in a leather jacket whom I took to be the driver of the limousine, and two porters pulling a baggage cart. The passengers were all talking to the whole crowd at the same time, as if they were old friends or relatives who had just met after a long separation instead of strangers who had arrived in a large city by chance on the same plane.

One of the passengers--it was the man with a slight stutter--said, "I still don't see why you let him get away with it." He held the right front door of the limousine so that his companion would have to sit in the middle.

"He knocked me down, I tell you," said the woman with the fox scarf. "What do you mean, why did I let him get away with it?" said the man with the deep voice. "You were standing right there. Why didn't you do something?"

"Well, for one thing," said the other man sarcastically, "it was you that wanted to use the phone, not me."

"Oh, what's the use?" said the man with the deep voice, accepting the inside seat. "It never does any good with people like that. They never change."

"You're absolutely right," said the woman with the fox scarf, employing elaborate gestures to arrange herself in the middle of the back seat. Her husband got in next to her, and I, not noticing the folded jump seats, sat down on the other side of her. The soldier took the jump seat in front of her husband, and the other two men were in the front.

"I wonder what he was in such a hurry to get to that phone for," said the soldier. He spoke in a flat nasal drawl.

"Business," said the man with the deep voice. "With those people it's always business." He held up a gloved hand and rubbed his thumb and forefinger together.

"And then you never can tell," said the soldier. "He might have had something on his mind."

"And did you notice the way he treated that sweet little hostess?" the woman interrupted. "Did you notice, dear?" Her husband cleared his throat. "With those people it's always self, self, self," she went on. "They have no human consideration for anyone whatsoever."

"Oh, I knew one or two of them that was all right," said the soldier. The man with the deep voice hummed skeptically.

After watching the porters stow our luggage in the trunk, the driver had gone back to the terminal building, and for a while we awaited his return in silence. We felt rather than heard the heavy rhythm of the limousine's motor. Both men in the front seat were smoking cigars, and the soldier and the woman lighted cigarettes. The stale air nauseated me, and at last I lowered my window about five or six inches. The woman, who had been smoking rapidly and nervously, stiffened beside me. "The snow seems to be coming in the windows," she pronounced mincingly. She sucked in a mouthful of smoke and expelled it immediately with a small explosion. Both men in the front seat turned around and watched me as I cranked up the window. Since leaving the plane, the woman had drawn an incongruously wide line across her mouth with lipstick. In the pale green light that came to us, filtered through snow from the terminal building, her mouth looked purple. "Really!" she muttered.

The man with the deep voice kept turning around to stare back at the terminal building, and we waited in silence once more. Tired as I was, I did not even look forward to sleeping. For me the tedium was almost entirely devoid of interest, appetite, or emotion. It was meaningless time, empty time, and the only thing I felt at all was a weak hatred for the other passengers.

"I wonder what keeps us waiting so long," said the soldier.

"Can't somebody do something?" the woman demanded resentfully.

The man with the deep voice stubbed his cigar out in the ash try and devoted himself for several minutes to staring back at the terminal building before he gave it up and lighted another cigar. "I should never have let him get away with it," he said softly. The motor was running all the time.

Finally there were voices, and we all looked to see who was coming. The driver was walking rapidly toward the limousine carrying a small aluminum suitcase, and trotting along beside him, looking up into his face earnestly, came the short, fat man in the big hat.

"So that's who kept us waiting so long," said the woman, settling back triumphantly. "So that's who it is," said the soldier. The man with the slight stutter grunted. "No human consideration for anyone else whatsoever," the woman reminded us.

After the trunk had been slammed shut behind us, the driver opened the door beside me, pulled up the second jump seat, and stood back to let the last passenger get in. But before the short, fat man got in, he examined the driver's face carefully. "And I could get a cab right away?" he said.

"Yes, yes, you could get a cab right away," said the driver, his tone suggesting that he had already answered the same question many times.

The man who had delayed our departure peered into the dark limousine suspiciously before taking his place on the jump seat in front of me. Only the stutterer met the newcomer's eyes, and then he looked expectantly at his companion. But the man with the deep voice was staring straight through the windshield in front of him. Nobody said a word.

The driver got in and we started on our way, with one loose chain clanking tiresomely against a fender above the soft sound the tires made pressing down against the dry snow.

The short, fat man sat sideways in his seat, his face almost pressed against the glass. At first I thought that he was merely watching the view, trying to get a glimpse through the windows of houses where for some reason there happened to be people still up at that late hour. But each time the limousine passed under a street lamp, as it did with rhythmic regularity, I could see that he was weeping, biting his large lower lip cruelly in an effort to control his trembling, contorted features.

FLIES EVERYWHERE

Flies are very common insects and you are probably very familiar with some of them already. House-flies and blow-flies often come into our houses in the warmer months, while daddy-long-legs or crane-flies are common visitors in temperate lands as autumn approaches. Out-of-doors you have quite likely seen hover-flies visiting flowers for nectar, although you may have mistaken them for wasps. You are lucky if you have not been bitten by a mosquito, midge or other blood-sucking fly.

These are just a few of the flies which you may already know. There are very many more. In Britain there are about 5,200 different kinds of flies, in North America around 16,200, in Australia about 6,300, while in the world more than 85,000 species are known.

But what is it that makes flies different from the other winged insects like bees, wasps, moths and lace-wings? The answer is that flies have only one pair of wings, the second pair are reduced in size and form club-shaped balancing organs called halteres. Because of this, the scientific name for flies is Diptera (from the Greek di, meaning two and ptera, meaning wings). From this definition you can see that if an insect has four wings it is not a fly. However, you will find that some four-winged insects have the word "fly" in their common name--butterfly, dragonfly, mayfly and so on. To make clear which are not flies, it is now usual for biologists to write the name of true flies with a hyphen (e.g., house-fly) and the names of other insects as a single word (e.g., butterfly).

Flies vary enormously in size and appearance, but they can be divided into three basic groups. The crane-flies, winter gnats, mosquitoes and midges belong to the first of these groups, the Nematocera (pronounced knee-mat-oss-er-a). They all have very long, thin feelers or antennae and slender bodies, and are mostly slow fliers. Many members of this group have the habit of swarming, usually towards evening when clouds of them may be seen a metre or two above the ground.

The second group is called the Cyclorrhapha (pronounced cyclo-rayfa) and contains the stoutly-built flies with short antennae, broad wings and fast flight. House-flies, blow-flies, and hover-flies are examples from this group. These flies rarely form swarms.

Robber-flies, horse-flies, soldier-flies and snipe-flies belong to the third group, the Brachycera (pronounced brakky-serra). In many ways these insects are halfway between the other two types of flies. Robber-flies, for example, are large flies with broad wings and short antennae but they have narrow bodies.

Like all insects, flies pass through a complicated life-cycle before becoming adults. This begins when the female fly lays her eggs in or near to food for the larvae to eat. After hatching, the larvae feed, but their cuticle (or skin) cannot stretch very much. So, in order to grow, they have to shed (or moult) their skin. This reveals a new skin which can stretch while it is still soft. After a short while the new skin hardens and no more growth can take place until the skin is moulted again. A larva moults several times before it is fully grown. Then it stops feeding and passes through what in most flies appears to be a resting stage. This is the pupa stage. Although nothing seems to be happening, the body of the larva is being broken down and rebuilt into the body of an adult fly.

The larva and the adult fly look quite different from one another. In the case of a house-fly, for example, the larva, commonly called a maggot, is creamy-white with no legs, no head and a short body which is pointed at the front end. The dark fly, however, has six legs, a pair of wings and a head with large eyes, antennae and mouthparts. The pupa bridges the gap between the two stages. The larva and the fly have different roles in life. The larva is the stage in which growth takes place, while the major job of the adult fly is to reproduce.

CROCODILIANS

A group of animals without a name is like a kitchen pot without a handle. Before we can even begin to consider the alligators, crocodiles, and their relatives, we must give them a handle, and the best one by far is "crocodilian." This name comes from a Greek word and is not hard to remember when its similarity to "crocodile" is kept in mind. In technical books these reptiles may be called either "Crocodilia" or "Loricata."

Among the major groups of reptiles the crocodilians number fewer kinds than any other, yet these few include the largest reptiles, and, in fact, no really small species exist. There are many small turtles, lizards, and snakes, but no one has ever seen a pocket-size crocodilian that was not simply an infant. It is not surprising that in such a small assemblage there is no great difference in the general appearance of individual species, and because of this it is easy to draw a word picture of a "typical" crocodilian. This cannot be done with the lizards, snakes, or turtles, as all of those major groups include at least hundreds of species instead of the mere twenty-five that comprise the crocodilians.

The body of the crocodilian is joined to the powerful tail so inconspicuously that, were it not for the hind legs, you might have trouble telling where the body ends and the tail begins. The tail is far from being a mere ornament, for without it the crocodilian would be unable to move about in its favorite element, water. The tail is all-important in the undulatory swimming motions. The legs are large, though not powerful like the tail. They are folded against the body when the animal swims, and are used only in carrying it about on land, where it can make some speed for a short distance.

Contrary to general belief, the crocodilian does not drag itself about, but raises the body high off the ground when moving on land. The belief in the dragging process probably arose from the sight of frightened crocodilians sliding into the water. At such times the animal may slide down a slippery, sloping bank without getting up on its legs. The tail is also a powerful weapon of defense, as anyone who stands near an enraged crocodilian will soon find out. A swift sideswipe of the heavy tail knocks a man down at the moment when a similar sideswipe of the open jaws has put them in a position to take the best advantage of the blow by the tail.

In addition to an ability to take care of itself by using the jaws and tail, the crocodilian is well protected on the back by a tough coat of hard, horny scales reinforced by little plates of bone. The horny scales are set in rows, and have keels that form continuous ridges. The resulting armor is so tough that it might be described as impenetrable, remembering, of course, that all such terms are relative. In some crocodilians, even the belly scales are reinforced with bone, and the massive skull is so bony that no vulnerable spot can be found by an enemy.

In spite of this formidable armor, the crocodilian, like the turtle, has a weak link in the chain of its existence. While developing in the egg and just after hatching, it is dependent on its mother for protection. The eggs are easily found and are relished by various mammals, and the hatchlings are comparatively defenseless.

The crocodilian is amphibious--that is, it lives both on land and in the water. It takes to water for protection and gets most of its food from water, though it must have land on which to lay its eggs. Sunny banks are a favorite haunt, and no doubt the habit of sunning is of importance to its health.

The great importance of water to the crocodilian is shown by the shape and form of its head, especially the bones of the skull. The openings of the nose are on top of the snout and near its tip. This is of course a very convenient place for the nostrils of an aquatic animal. In most reptiles the air passes through the nostrils and into the mouth, allowing the shipping of water into the air supply when the head is submerged and the mouth is not kept tightly closed. The mammals avoided this difficulty by developing in the mouth a roof (the palate) above which the air passes to the throat. The crocodilians did the same thing much better and long before the mammals. The air that enters the nostrils at the tip of the long crocodilian snout must pass above the palate and into the throat, which can be closed by a flap of mucosa. If a crocodilian seizes an animal below the water, the necessary opening of the mouth does not interfere with breathing. The position of the eyes high on top of the head enables the almost completely submerged crocodilian to keep a watch on its surroundings while it breathes comfortably by means of the elevated nostrils at the tip of the snout.

Experiments have shown that at least the American alligator can remain under water as long as five hours before drowning. The length of time for drowning probably differs from species to species and depends on the water temperature and the activity of the animal.

The crocodilians as a whole had their heyday during the reign of the dinosaurs and give us a glimpse of the life of the Age of Reptiles when gigantic scaly creatures were the most conspicuous forms of animal life. The few crocodilians alive today, remnants of a glorious past, may be thought of as living fossils. In contrast to this, the crocodilian's body is not without its modern developments. The heart, for example, has four chambers, the teeth are in separate sockets, and the body is divided by a diaphragm or muscle that is used in breathing. These "living fossils" can thus look down their long noses at other reptiles and justly claim to be ahead of them in these important improvements that were only later developed by the mammals themselves.

In the United States at least, the question most often asked about crocodilians is: "What is the difference between an alligator and a crocodile?" It is not surprising that this question has become so popular in a country with but one crocodile and one alligator. Yet even in the United States the question has little practical point, as the natural ranges of these two crocodilians approach each other only in extreme southern Florida--the American crocodile, like other crocodiles, being a tropical reptile in contrast to the American alligator, which lives in a temperate region. Because of this difference in ranges, these two animals can almost never be confused by the hunter.

Looking at the matter from a specific point of view, we see that the alligators and crocodiles are placed in separate families, and therefore must have many differences in the way they are put together, so to speak. To point out these differences would take us beyond the scope of this work, but a glance at an American alligator placed next to an American crocodile will show that we need only remember that the alligator's snout is much the broader. With a little practice anyone can tell one from the other instantly. To carry the matter still further, it can be pointed out that in agreement with the more narrow snout of the crocodile, the fourth tooth of the lower jaw fits into a groove of the upper; in the broad snout of the alligator this tooth slips into a pocket of the upper jaw.

The question of greatest size is as annoying to the specialist as it is fascinating to the layman. The trouble with it is that facts are almost impossible to get, and the larger the animal concerned the harder the problem. Moving very large reptiles about is hard enough in any case, but when one of these creatures is of gigantic proportions the difficulty becomes truly formidable. Everyone knows the temptation to stretch measurements, and what chance is there for even a professional reptile man to encounter one of these enormous individuals? Skinning the carcass does not help because skins are always much longer than the body from which they came.

The scientific student of reptiles is prone to exaggerate these stumbling-blocks and to avoid the question of greatest size. But this attitude is not reasonable because size is important from the scientific as well as from the lay point of view. The experience of Dr. Schmidt at Lake Ticamaya, Honduras, well illustrates the point. The average size of the numerous American crocodiles at this lake was reported as 15 feet, and an alleged 12-footer had just been shot by a "gringo" hunter. The tape measure applied to this specimen proved it to be only 8 feet 9 inches long. Dr. Schmidt remarks at this point that the naturalist who carries a steel tape is sure to be discouraged. The largest specimen encountered during the week of hunting at Ticamaya measured only 11 feet 2 inches.

By measuring many skulls of crocodilians of known length Dr. Schmidt has come to some sobering conclusions for the lover of record sizes. For example, a notorious man-eating salt-water crocodile that lived on Luzon in the Philippine Islands was shot by two hunters, who recorded its length as 29 feet, its girth as 11. Fortunately, the skull was brought to this country, where it is considered to be the world's largest crocodilian skull. On the basis of its measurement (about thirty inches), the possessor could not have been more than 22.5 feet long.

Strangely enough, the most reliable record measurement made by a scientist was taken more than a century ago by the famous explorer Alexander von Humboldt. This measurement was of an Orinoco crocodile 22 feet 4 inches long. The following summary of approximate crocodilian dimensions is taken from Dr. Schmidt.

When the crocodilians are arranged in order of size they may be roughly divided into three groups--giant, large, and small. The difference between the average and greatest lengths is often very marked. This probably means only that measurements have been taken on too few individuals; if hundreds of specimens were measured, the gap would be much smaller.

Crocodilian life histories are obscure at best, and when it comes to reproduction, we are truly in the dark. The evasive word "reported" must be used all too often. Frequently we must fall back on casual observations of sportsmen who may or may not be trained in scientific observation.

As far as is known, all crocodilians reproduce by means of eggs laid in nests that are usually guarded by the female. The life history of these giant reptiles is simple when compared to those of the other reptile groups with the exception of the turtles: all turtles lay eggs that are buried in the ground by the female and then deserted. The life histories of lizards and snakes are much more varied; in both groups some species may lay eggs, others bring forth young more or less after the fashion of mammals. In some snakes the eggs are carefully guarded, in others they are deserted, and so on.

Several kinds of crocodilians are reported to add one maternal touch that puts them ahead of the other reptiles: the mothers, when attracted by sounds made by the hatching young, open the nests to let the offspring escape.

Both sexes of all crocodilians have two pairs of sex or scent glands that secrete most actively during the mating season. One pair is in the lips of the cloaca, the other opens to the outside on the right and left halves of the lower jaw. It is presumed that these glands secrete stuff that helps the individuals find one another during the mating season.

Crocodilian hides furnish excellent leather that is used extensively in the manufacture of such items as shoes, trunks, traveling bags, pocketbooks, and various novelties.

Great waste is unavoidable because, with the exception of small individuals whose entire hides are made into novelties, only the skin of the belly and sides is processed. The plates of bone in the skin of the back make it valueless, and for the same reason even the belly skin of some species cannot be used.

The United States has been a good market for crocodilian hides since the early part of the last century; by 1850 the trade was still extensive, and even as late as 1902 some 280,000 skins were tanned annually, about half of them coming from Mexico and Central America. It is estimated that the annual take in the 1920's had fallen off to 50,000 a year. It need scarcely be added that the slaughter of literally millions of alligators has greatly reduced the population; in 1929 the species was still abundant over only about half of its original range. The tropical crocodilians hold their own better. An extremely interesting report by Dr. Remington Kellogg on the economic importance of alligators was published by the U.S. Department of Agriculture in 1929.

THE DESENSITIZATION OF TWENTIETH-CENTURY MAN

Section I

It happened at the Stamford, Connecticut, railroad station. It was Sunday evening, at about ten p.m. Some two dozen persons, among them several young men in uniform, were waiting for the express to New York.

The door to the waiting room flew open. A woman, shrieking hysterically, burst into the room. She was pursued by a man just a few steps behind her. The woman screamed that the man was trying to kill her and cried out for the people to save her. I was standing nearest the door. The woman grabbed me; still shrieking. I tried to protect her behind me. The man tried to sweep me aside to get at her. He rushed at me, caught the woman's wrist with one hand, tore her loose and pulled her through the doorway. The woman fell to the ground and was dragged by the wrist just outside the waiting room. I tried to free her wrist. The man broke off, grabbed the woman's pocketbook, and fled on foot.

Section II

We carried the woman inside the waiting room, sat her down, then telephoned the police. The woman's eye was badly cut; she was moaning. I looked around the room. Except for three or four persons who now came up to her, the people in the room seemed unconcerned. The young men in uniform were still standing in the same place, chatting among themselves as before. I am not sure which was greater, the shock of the attack that had just occurred or the shock caused by the apparent detachment and unconcern of the the other people, especially the men in uniform.

The next morning, I read in the newspaper of another attack. This one was carried out in broad daylight on a young boy by a gang of teen-agers. Here, too, a number of people stood around and watched.

Section III

It would be possible, I suppose, to take the view that these are isolated instances, and that it would be a serious error to read into these cases anything beyond the fact that the bystanders were probably paralyzed by the suddenness of the violence. Yet I am not so sure. I am not sure that these instances may not actually be the product of something far deeper. What is happening, I believe, is that the natural reactions of the individual against violence are being blunted. The individual is being desensitized by living history. He is developing new reflexes and new responses that tend to slow up the moral imagination and relieve him of essential indignation over impersonal hurt. He is becoming casual about brutality. He makes his adjustments to the commonplace, and nothing is more commonplace in our age than the ease with which life can be smashed or shattered. The range of the violence sweeps from the personal to the impersonal, from the amusements of the crowd to the policies of nations. It is in the air, quite literally. It has lost the sting of surprise. We have made our peace with violence.

Section IV

No idea could be more untrue than that there is no connection between what is happening in the world and the behavior of the individual. Society does not exist apart from the individual. It transfers its apprehensions or its hopes, its fatigue or its vitality, its ennui or its dreams, its sickness or its spirituality to the people who are part of it. Can the individual be expected to retain the purity of his responses, particularly a sensitivity to the fragility of life, when society itself seems to measure its worth in terms of its ability to create and possess instruments of violence that could expunge civilization as easily as . . . destroy a village? Does it have no effect on an individual to live in an age that has already known two world wars; that has seen hundreds of cities ripped apart by dynamite tumbling down from the heavens; that has witnessed whole nations stolen or destroyed; that has seen millions of people exterminated in gas chambers or other mass means; that has seen governments compete with one another to make weapons which, even in the testing, have put death into the air?

To repeat, the causative range is all the way from petty amusements to the proclamations of nations. We are horrified that teen-age boys should make or steal lethal weapons and then proceed to use them on living creatures; but where is the sense of horror or outrage at the cheapness of human life that is exploited throughout the day or night on television? It is almost impossible to see television for fifteen minutes without seeing people beaten or shot or punched or kicked or jabbed. It is also almost impossible to pick up a newspaper without finding someone in a position of power, here or elsewhere, threatening to use nuclear explosives unless someone else becomes more sensible.

Section V

The young killers don't read the newspapers, true. They don't have to. If they read at all, they read the picture-story pulps that dispense brutality as casually as a vending machine its peanuts. In any case, the heart of the matter is that the young killers do not live in the world of their own. They belong to the larger world. They may magnify and intensify the imperfections of the larger world but they do not invent them.

The desensitization of twentieth-century man is more than a danger to the common safety. It represents the loss or impairment of the noblest faculty of human life--the ability to be aware both of suffering and beauty; the ability to share sorrow and create hope; the ability to think and respond beyond one's wants. There are some things we have no right ever to get used to. One of these most certainly is brutality. The other is the irrational. Both brutality and the irrational have now come together and are moving towards a dominant pattern. If the pattern is to be resisted and changed, a special effort must be made. A very special effort.

DON'T LET STEREOTYPES WARP YOUR JUDGMENT

Are criminals more likely to be dark than blond? Can a person's nationality be guessed from his photograph? Does the fact that a person wears horn-rimmed glasses imply that he is intelligent?

The answer to each of these questions is, obviously, "No."

Yet, from the evidence, many of us believe these and other equally absurd generalizations. Aren't all Latins excitable, all Swedes stolid, all Irish hot-tempered? Think about any group of people--mothers-in-law, teenagers, truck drivers, bankers--and a standardized picture forms in our heads.

These stereotypes, by which we commonly picture professions, nationalities, races, religions, are closely related to the dark world of prejudice--which means pre-judgment. We prejudge people, before we ever lay eyes on them.

The irrational stereotyping begins early in life. The child, watching a TV Western, learns to spot the Good Guys and the Bad Guys. Some years ago a psychologist showed how powerful these childhood stereotypes are. He secretly asked the most popular youngsters in an elementary school to make errors in their morning gym exercises. Afterward he asked the class if anyone had noticed any mistakes during gym period. Oh, yes, said the children. But it was the unpopular members of the class--The Bad Guys--they remembered as being out of step.

Stereotypes save us mental effort: They classify into a convenient handful of types the infinite variety of human beings whom we encounter. Thus we avoid the trouble of starting from scratch with each and every human contact in order to find out what our fellow men are really like. The danger, of course, is that stereotyping may become a substitute for observation. If we form a preconception of all teenagers as "wild," for example, it doesn't alter our point of view to meet a serious-minded high school student. This is "the exception that proves the rule," we say.

Moreover, quite aside from the injustice it does to others, stereotyping impoverishes us, too. A person who lumps his fellow men into simple categories, who typecasts all labor leaders as "racketeers," all businessmen as "reactionaires," all Harvard men as "snobs," is in danger of becoming a stereotyping himself. He loses his capacity to be himself, to see the world in his own unique and independent fashion.

Instead he votes for the man who fits his standardized picture of what a candidate "should" look like or sound like, buys the goods that someone in his "situation" in life "should" own, lives the life that others defined for him. The mark of the stereotype person is that he never surprises us, that we do indeed have him "typed." And no one fits this straightjacket so perfectly as someone whose opinions about others are fixed and inflexible.

Stereotypes are not easy to get rid of. Sharp swings of ideas about people often just substitute one stereotype for another. The true process of change is a slow one that adds bits and pieces of reality to the pictures in our heads, until gradually they take on some of the blurredness of life itself.

Can we speed the process along? Of course we can.

First, we can become aware of the standardized pictures in our heads, in other people's heads, in the world around us. Second, we can be suspicious of all judgments that we allow exceptions to "prove." (There is no more chastening thought than that, in the vast intellectual adventure of science, it takes but one tiny exception to topple a whole edifice of ideas.) Third, we can learn to be chary of all generalizations about people.

Most of the time, when we typecast the world, we are not in fact generalizing about people at all. We are only revealing the embarrassing facts about the pictures that hang in the gallery of stereotypes in our own heads.

EXPLORING THE UNKNOWN

Section I

After thousands of years of civilized history, it was not until the 17th century that man finally uncovered the fact that nature operated in accordance with laws that could be discovered; laws that were so exact that they could be used to predict with precision the behavior of physical bodies. And at the same time men were uncovering these startling regularities of nature--the grand and beautifully simple laws which nature obeyed--they also discovered the infinite complexity of nature; that there were undreamed-of phenomena awaiting discovery--for those who were willing and able to explore.

And so it was that during the past 300 years scientific knowledge slowly came into being until, at the beginning of the 20th century, the time was ripe for the explosive rise of applied science.

Now this development of applied science has been one of the most spectacular phenomena of our generation. It has revolutionized our way of living--and possibly also our way of dying. It has transformed the lives of millions of people, and has elevated their hopes and ambitions, too. Science has become the new "magic"--it is, some people seem to think, capable of doing anything.

Section II

And yet there are disquieting notes mixed in with the growth in public acclaim for applied science. The refrigerators and tooth paste are appreciated and enjoyed. But the scientific knowledge which made all these things possible is forgotten or ignored. The latest gadget for better living is promptly purchased on the installment plan. But when someone mentions weapons for defense, a great cry goes up: "The scientists are tying to destroy us." In fact, in these days it has become feasible in some circles to say we have had "too much science"; that "science is the cause of most of the world's troubles"; that we ought to "return to the liberal arts"; that science ought now to wait a while so that social science can "catch up." The idea is, presumably, that social science or the liberal arts or something will then teach us all how to love one another so that human beings won't end up by atombombing themselves off the face of the earth.

To hear some people talk, you would think that science causes nothing but unhappiness, conflict, war; that science denies the finer things of life; is too "technical" to have a place of respect in modern education. You would think that the fate of the world rested on the outcome of some sort of race between scientists on the one hand and all the historians, philosophers, writers, economists, poets, preachers, and political and social scientists on the other, with the implication that if science wins, the human race will be blasted to oblivion.

Section III

Some people talk as though they really believe some or all of these things. In fact, there are some very important people who are making it their business to promote these ideas. I think it is time that we, the scientific community, began to do something about the attacks which have been made on science and on scientists. For they are having profound and even terrifying effects. They have already caused an alarming drop, for example, in the number of high-school students who take mathematics and physics. They have caused many a serious-minded college or university student to avoid all science courses and to look with disdain on those who major in science fields. They have caused well-meaning people to believe that scientists are necessarily so specialized and blind as to be wholly untrustworthy the moment they step out of the laboratory, and to class all scientists and engineers as "narrow-minded technicians."

How then do we go about meeting these charges, these misunderstandings and prejudices?

First, I want to say that I do not think the way to do it is to brag more about the gadgets and devices and weapons which have come about as a result of the systematic attempts to make use of scientific knowledge. I have great admiration for deep freezes and bulldozers and jet airplanes and detergents and penicillin--and even pink and white Cadillacs. But values of science really do not lie in these things in themselves.

Rather, they lie in the way in which pure and applied science contributes to man's physical, intellectual and spiritual well-being. The true values of science lie not in its by-products, but in its goals; not in its dollar value, but in its human value. The value of science will be judged not by how fast it helps us to travel, but where it helps us to go.

In order to get a better look at this problem, I think we should forget about applied science for a moment and think about basic science, the pure search for knowledge.

First let us ask why men are scientists. Why do men spend their lives in pure science? Well, I can assure you it is not because of any desire to destroy the world or even to harm a single human being, or make him less happy. Quite the contrary! Nor is the scientist usually impelled primarily by a desire to make money--though I am sure he looks forward to receiving the monthly paycheck as much as anyone (especially when the fresh Ph.D. today can go out into the first job at $10,000 a year).

On the other hand, I can't claim either that the scientist's objective is wholly or primarily an altruistic one--trying to make the world over into a Utopia, for example. He simply hopes that his work will be some contribution to human welfare.

Primarily, it seems to me, the scientist is impelled by certain basic human urges. One is the urge to explore. The spirit of Christopher Columbus, of Magellan, of Admiral Byrd; the spirit of all those who have first discovered unknown places or climbed unconquered mountains--such a spirit is in each of us to some extent. It is certainly in every scientist, even though few of them have bothered to recognize it.

Section IV

Another common human urge is the urge to create. Every human being would like to create something new. Just look at the "do-it-yourself" business! Some people create music or poetry; some create beautiful pictures, fine statues, magnificent buildings, exquisite furniture or jewelry or clothing. So too, a new discovery in science is a creation--and in the eyes of scientists it has a beauty and an elegance all its own. To be able to contribute, even in only a small way, to the building of the magnificent edifice which we call science is a great creative satisfaction.

Add to the urges of exploration and creation the urge of competition--the desire to be the first to find a given piece of knowledge--and one has a good description of a scientist's motivation.

How can it be then that the structure of science, which results from such almost purely aesthetic motivation and which is admired by the scientists as a thing of beauty and a joy forever, can be looked on by the general public as an ugly, mundane, or even dangerous product? It is true, of course, that some works of art are admired only by the artist, and the artist then complains that the public doesn't "understand" his work. So I guess the scientist also sighs that the public does not understand him or what he does. But if science is to have the surging vitality that it should have in modern America, the public should understand science.

Our usual attempts in this direction, however, are often inadequate. We usually try to explain the value of science not by telling why it is beautiful, but only why it is useful. Hence, scientists are mere technicians, specialists, unaware of the finer things of life!

Now, explaining why a thing is beautiful is much harder than explaining why it might be useful. Yet is is worth trying. We can be encouraged, I think, by the great public interest in astronomy. Everyone knows that the Palomar 220-inch telescope has no very "practical" uses. Yet thousands of people journey to Palomar every month to see that magnificent instrument and to hear about the awe-inspiring picture of the universe which it is revealing. Exploring the universe is an adventure which almost anyone envies and admires. And the beauty and grandeur of the universe is at least dimly visible to almost everyone who cares to listen and to look at pictures.

However, I claim there is an equal beauty and grandeur to the picture of an atom of iron or copper or uranium which modern science has revealed. Even more beauty, perhaps, is to be found in the structure of a protein molecule. More still is in the structure of the gene as it is built up of spirals of nucleic acids all so ingeniously designed that the gene can make a copy of itself--can reproduce its kind. With all due respect, I claim there is as much beauty in such things as can be found in great paintings or fine literature or music.

Section V

In any case, if science were seen and taught in such a light, we would not see the presidents of great universities (not scientists) going around the country saying, "There is too much emphasis on science; let us return to liberal arts."

Science is one of man's greatest arts and is one which has done the most to liberate the human spirit. Science, more than any other subject, has freed men from ignorance and from consequent fear. Consequently, it has elevated man, intellectually and spiritually.

How does it happen that many people have just the opposite conception--that science has been degrading to man; has made him materialistic, unmoral? Apparently it is because scientists are wholly misunderstood.

For example, a distinguished religious leader recently said, "Modern technologists and scientists have come to regard themselves as supreme masters of the universe." Well!

That's news to me. Some scientists might have good ideas about some improvements they would make if they were! But the only men in recent times who have thought themselves masters of the universe (Hitler, Mussolini, Stalin) were certainly not scientists! Science is a pursuit that makes men humble--because in learning a few things we come upon so many that we don't know.

But why do these misconceptions of scientist exist?

Section VI

Personally, I put part of the blame for this on certain miguided philosophers. For example, since the instruments of the scientists have discovered no non-material or non-physical aspects of the world, therefore the scientist is accused of saying that such immaterial things do not exist. Because the anatomist found no place in the body to house a soul, therefore, says the philosopher, this proves man has no soul! That's nonsense, of course. Physical instruments were never intended to measure non-physical things and, by their nature, they can never do so. Science thus gives no support to materialism--nor, of course, can it ever disprove it either. Philosophical theories are just not susceptible to experimental proof or disproof.

Again--philosophers have gone wild speculating about the theory of relativity and its philosophical implications. Now the special theory of relativity is simply a theory in physics which describes how the results of observations made on various phenomena will depend on how the observer is moving relative to what he observes. "Aha!" says the philosopher, "that means everything is relative; nothing is absolute. There are no absolutes physically; therefore there are none intellectually or morally either. It all depends on your point of view."

Nonsense again. Aside from the fact that physical theories have no necessary relevance to moral problems, the philosopher totally misunderstands Einstein's relativity theory. Though the relativity theory did show that many observed quantities were changed when there was relative motion (as had always been known), Einstein found that certain things (the velocity of light, for example) were unchanged. They were "relativistically invariant"; they were "absolutes."

A beautiful physical theory thus has been misunderstood and misused; again science has been misrepresented.

Then, too, there were philosophers who said that the theory of evolution denied the existence of God! No scientific theory can either affirm or deny a spiritual existence, of course.

Section VII

To me the whole picture of the universe as revealed by science, as well as the picture of the processes that go on within it and of the life that inhabits it, is one of magnificence, vastness, order, splendor, precision, beauty. It is a picture that exalts the Creator of the Universe--and exalts the dignity of the men He created, the men who can discover and comprehend this majesty of creation.

You see, perhaps, why I can claim that science is one of the "liberalizing arts." You see why it deserves a place of respect along with the humanities, the fine arts, and social and behavioral studies as partners and coequals in the intellectual and cultural fields. You see why to dismiss science as too "technical" and too "vocational" is both false and revolting.

However, there are men who say science is still not enough. Of course it isn't. And I do not know any scientist who ever claimed it was. The study of the physical world is one important aspect of man's use of his intelligence and his talents. It is one expression of the urge to know, to create. But the studies of the world of human beings, of the world of beauty and the world of moral values are equally essential activities--all are necessary to the educated and civilized man.

Perhaps, however, the most damaging blows struck by the anti-scientists are those which prey upon the fears and dangers of the modern world which applied science has helped to build. These dangers are indeed real and terrifying. And scientists will do well to continue making factual statements about what these dangers are. Thermonuclear bombs are really horribly devastating weapons--and don't let anyone tell you otherwise.

But the real basis for our fears today is not the human ingenuity that produced terrible weapons, but the human cussedness that threatens to use such weapons against us. The world has never been free from danger. But if we contrast the western world of today with that of 100 years ago, we find much to be proud of. We have eliminated slavery--because our work is now done for us by lumps of coal and pools of oil. We have eliminated much of human suffering caused by ailments and disease--and we will no longer tolerate the existence of suffering caused by human cruelty or neglect.

We have eliminated many evils and many dangers; we face many more of both old and new varieties. But we shall conquer danger not by weeping and wailing, not by stopping or impeding any worthwhile human endeavor, by belittling any noble human aspiration. We shall conquer fear in the end only if we continue to explore the unknown in every field of human endeavor, continue to extend always the frontiers of knowledge, aiming always to elevate the human mind and the human spirit.

REASON TELLS US THAT THIS IS WRONG

Nothing that exists in this world is evil. Everything is good. The use of things is not wrong, but the misuse of things is. A Cadillac in itself is good. But if I drive it at top speed through a crowded street and bring injury and death to several bystanders, my actions are evil. The auto is still good, but I have misused it. Or, if I employ a shotgun to shoot not pigeons but people, then the misuse of this weapon is something evil.

Of course, we cannot determine if a thing is misused unless we know its correct use. This is true of the smallest atom and the largest skyscraper. They all have a proper purpose and a correct usage. Our eyes, our ears, and our voices all are designed for definite purposes. When we frustrate these purposes, we do wrong. For instance, our voices have been given us that we might communicate honestly and truthfully what we are thinking. Everytime we read a paper or listen to a news analyst, we accept this principle. We trust men to tell us what they think is true. But when we tell a deliberate lie, then we consciously frustrate the purpose for which the power of speech was given us. We have misused this tremendous faculty; we have thereby done wrong.

Paramount among the wonderful activities man is capable of is procreation. Besides the powers to think and will which are replicas of God's faculties, He has given man the ability to cooperate with Him in creating new life. These generative powers are given to all normal men and women for the purpose of perpetuating the human race. It is axiomatic that those who bring such life into existence should assume responsibility for it. And since this obligation is not a light one, mankind must be encouraged to assume it and be rewarded for doing so.

Thus God has attached to this faculty a deep and instinctive drive and a unique physical pleasure. These things are normal and good. There is nothing evil or warped about sex instinct or pleasure. Only their misuse is wrong. Did you ever start to cross a street, then barely see the flicker of an approaching vehicle and find that you have automatically, without thinking at all, jumped back to the safety of the curbstone? If you have had this experience, then you witnessed the subconscious drive all men have of self-preservation. Equal to this in unrelenting intensity is the drive for self-perpetuation, more popularly identified as the sex instinct. This leads mankind to discount the burdens of parenthood and to cooperate again and again with God in bringing human life to exist for all eternity. Besides this, parents experience a unique reward called sexual pleasure. These feelings are attached to the use of the generative faculty. And although all of our senses bring us pleasure, they do not match in any way the sensations evoked by the use of the creative faculty. This is proportionate because none of the others involve us in such tremendous responsibilities. Thus instinct and pleasure cooperate to encourage men to use their generative powers. But observe, the purpose of these faculties is the production of new life, not pleasure. Therefore, when a man deliberately excludes the proper purpose and makes this godlike act of procreation an act of mere pleasure, he does wrong.

Among the sins of man there is no parallel of this. A crime it approximates is an opprobrious custom of the ancient past. In the days when Roman culture had flowered and then began to decay the aristocracy built huge and lovely villas in renowned spas such as Pompeii. There they lived in over-nourished luxury. It was then that the practice of all night dinner parties began, made up of twenty or thirty of the richest courses imaginable. And since the human body could not consume such quantity and variety of food, the guests would occasionally retire to a room adjacent to the dining area where they would regurgitate and then return to continue feasting. Such a practice appalls the modern man whose acts parallel the sins of the Romans when he practices artificial birth prevention to enjoy the pleasures of marriage while excluding its proper purpose.

Do not misunderstand! The Church does not say that those who practice planned parenthood today are degenerate. She does not say that they are decadent. But she does say that the two actions are equivalent and that people today can be excused only because they lack the proper information or have not thought deeply on the question. Reason, if correctly employed, should tell all men that this practice is morally wrong.